

# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

Vol. XXXVIII  
No. 11

NEW YORK, MARCH 14, 1918

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"Keeping Your Car Young"—it's free.

**S.C. JOHNSON & SON, Dept. A, Racine, Wis.**





# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

VOL. XXXVIII

NEW YORK—THURSDAY, MARCH 14, 1918—CHICAGO

NO. 11

## Opposition to War Truck Is Acute

Strenuous Objection to It in Spite of Small Numbers Needed  
As Compared With Great Commercial Demand—  
War Standardization Needs Different

THE standardized war-truck program which has been under way since last July continues to be the center of attack by a few truck manufacturers, and it is difficult to see why there is such determined opposition to the standardized truck program, when the number of these trucks ordered for army use in France is so small compared to the output of trucks needed for commercial uses at home.

The present order is for 10,000 of these war trucks, which is a relatively small number compared with special types of trucks that have been ordered in much larger numbers for moving artillery where the drive is distributed to the four wheels and where traction is one of the great objects to be obtained. Should this order be raised to 20,000 per year or even higher its proportion then to the total output of the country is so small that it is difficult to understand why the great attack upon it. The truck has been developed to meet peculiar war needs just as special types driving through all four wheels have been purchased in great quantities for use in special war fields. The output of motor trucks for this year for both war and industry will approximate 300,000. It may go higher if materials can be obtained and it is possible to get them delivered to the customer.

It is impossible to compute the total number of trucks needed in the war per million of men. Great Britain and France differ very materially in the numbers needed as compared with each other and as compared with Italy. It is possible that we will

require a higher percentage of trucks than either; in fact, the amount of motor apparatus to be used with our army will perhaps be greater than that used by any of the allies; but even then those percentages of standardized vehicles will be very small, perhaps not 10 per cent compared with the consumption of trucks at home.

The present standardized war-truck idea had its conception in the Mexican service two years ago, when truck makers generally agreed that the average commercial truck was not robust enough for such service and a heavier and stronger vehicle was needed. Soon after a committee was formed to work with Washington and it was in this co-operative work that the seeds of the standardized war idea germinated. Later the Washington work passed from one set of hands to another, but the one idea of a standardized war vehicle continued.

When the government last summer issued a call for engineers to assist in the development and design of a standardized truck, including all of the standardized units, there was a very generous response and some of the companies that are to-day opposing the standardized truck movement were co-operators at that time. The majority of them still are.

It is unfortunate that the attack on the war truck should have been delayed until the very month in which production is coming through, as there were ten days ago complete parts for over 200 of the

Class B trucks. Much time and energy have been spent on developing these truck parts and manufacturing them, which energy might have been saved if the truck is a failure, as many of those attacking it would like to make out.

Every standardized program that embraces some new scope is sure to be the center of an attack. The standardization program on railroad equipment is now being attacked and yet the railroads are short of equipment and short of men to manufacture it. The standardized boat program was attacked and held up for many valuable months. The standardized aviation engine program has been constantly attacked and has been the goal of some pernicious pro-German propaganda; and the attacks against this engine would have been immeasurably greater if a real aviation industry had existed previous to the time when work was started on the aviation engine. There was very little aviation industry, and while there were a few companies making aviation engines and planes they have very commendably buried existing prejudices and entered into the very imperative air program.

#### Opposition in France and England Also

In France and England there has been continual opposition to standardized programs. Had several companies been manufacturing tanks previous to the war there is not any question but that there would be on the British front to-day and throughout England a stirring controversy as to which tank should be used and it might be that home politics would declare that two or three different makes be used to the confusion of the army in the field.

Previous to the time the government took hold of the motorcycle situation there was very acute opposition to standardization, although there were relatively few motorcycle manufacturers; yet when the urgent demand for a motorcycle with certain standardized parts was made the job came through. There was not a necessity for a better machine than was being built, but it was essential to have standardized parts in order to eliminate the needless complications of drivers, to reduce the work of part storage and to facilitate repair work. The special war needs had to be met and are being met in the new jobs.

#### An Example from France

The tank situation in France offers a little example of what a standardized tank means in the matter of repair, because Chinamen are generally used for the repair work on these. These Chinamen are not skilled mechanics. There is a shortage of skilled mechanics in France, but it has been possible to train them into making good repairs when each movement is analyzed and special conveniences devised to effect these several repairs. When trained in this work they do it effectively and speedily. It is questionable if it would be possible to train schools of such mechanics to care for ten or more different models of tanks. The armies in the field would be loaded with a needless burden.

We are to-day not so short of trained mechanics in France that we have to get Chinamen to man our big repair depots, but we are not yet into the war, in

a large fighting sense. Recently an army officer of one of our Allies when asked when the war would end, replied: "I do not know when the war will end, but I know when it will begin—the summer of 1919 when the United States gets its fighting machine into work."

We must not forget that the actual fighting of this war is being done in France and Belgium and not at home, and while it is easy to stay at home and run the war and win it, as nine persons out of ten know how to do, it is scarcely fair to our forces on the other side to do a single act that will complicate the job they have on hand. It is scarcely fair to do a single act that will tax more than it is to-day our very acute shipping facilities. It is scarcely fair to do any act that will draw more heavily on our short supply of skilled repair men on the other side. It is scarcely fair to take any step that will require a single additional man in France to do a job, when by some principle of war it could be done with fewer men.

#### Essential and Non-Essential in War

It is permissible to ask the pertinent question, *Does a time not arrive in any industry which is a prime essential in war, but which has heretofore been only an industry of commerce*, when the war aspect of it must be entirely divorced from the industrial side?

Take an example: Perhaps it is scarcely realized as generally as it should be that the motor truck is a first essential in war. This is the first war the truck has been used in, and when the war started the essential character of the truck in the battle zone was not realized. The war has developed types of motor apparatus that are highly successful in war but at present we cannot see any fields for them in commercial life. We have rifles that are suited for war, there are machine guns for war, but nobody would go shooting in a forest with a military rifle or use a machine gun at a pigeon shoot. This differentiation in firearms has been a program of centuries and as a result the field has very clearly divided itself into two divisions, one of which is war and the other non-war.

#### Must Not Inject Commercial Aspect

One of the American trucks that is giving a first-class account of itself in France, and has been doing so for nearly three years, is looked upon as quite old-fashioned and almost obsolete at home, and when the contracts for it were first placed there was very general criticism of that particular country for making such a selection. Yet continual reports, and some of them are through official channels, show that it is a favorite, because it is very robust and powerful and gives a good account of itself in the rough work in France and Belgium. This truck is scarcely heard of in commercial circles at home, and its case is an example of how attention must be given to the job of war, and if necessary the products for war must be entirely divorced from those of peace. At least, we must not make our war program suffer because of our desire to inject the commercial aspect too forcibly.



It is highly probable that we will yet have to do many things in this war that were not conceived possible only a year ago, and yet we have not had a real battle with the Hun. We must not play this war as if it were to be over in November, as too many think possible. We at home must play the war as it is best played on the slopes of France.

We hold no special brief for the standardized war truck any more than for the standardized tank, the standardized aviation engine, the standardized motorcycle, the standardized machine gun, the standardized rifle and standardized ammunition. The essential reason for all of these standards is best shown in the war zone. There they use standardized houses, standardized hospital depots, standardized ambulance bodies and standardization in everything else that will make it possible to accomplish a greater job in the war zone, in less time and with fewer men than it would otherwise be possible to do it.

#### May Prove Suitable for Commercial Purposes

The standardized war truck had its inception as a weapon of war on the Mexican plains. It was designed as a weapon of war for the rough work of France. If it might prove suitable for commercial lines that would be a secondary consideration. Because of this it is difficult to construe the present attacks against it, before it has had a fair chance to demonstrate its worth. Some conditions in France are not so bad and some are worse. The ammunition must be moved to the front, and to-day the motor truck is used. Perhaps the truck is not the eventual vehicle for this work. It may soon be done by special types of tanks which will afford much

greater protection to the men. That, too, if developed, will unquestionably be a standardized job.

This is no time when financial interests should attempt to serve the purposes of commerce at the expense of our armies in the field. If standardization is good in peace, and we deem it essential in the automobile industry, then it is doubly needed in war.

#### Standardized Truck Should Have Fair Test

AUTOMOTIVE INDUSTRIES asks for a fair test for the standardized war truck, and not a premature condemnation. Give it as fair a chance as other weapons of the war. The Liberty aviation engine is proving so admirable a job that the use of it in other departments than aviation is at present under investigation, not by us but by our Allies. They have learned the urgent needs of standardization. They have learned the lesson of repair work at the front and training men to make speedy and efficient repairs. They have learned the lesson of the problem of spare parts for multiplicity of machines. Yet the Liberty engine is not through its growing and developing pains, and parts are being changed, and it would be a miracle if there were not parts that had to be changed. Some there are who have continuously condemned it and will continue to condemn it, but the engine goes on and already represents a great war conquest.

It would be surprising if there are not some mechanical defects in the war trucks. There will be some, and there will continue to be some, the same as with all war apparatus. France still has troubles with premature explosions in her guns, but they are not condemned.

### Assembling Standardized War Trucks



*Class B standardized war trucks in one of the fourteen factories that have contracts to assemble these trucks. Production was to have started in December but it has just started and 300 are to be completed this month*

# 4,941,276 Cars and Trucks

*in the*

## United States

**First Year of War Shows  
Record Gain of 1,396,324—  
One Car for Every 20 Persons  
—Eight States Each Have  
Over 200,000 Vehicles**

**Number of Cars and Trucks Registered on  
Jan. 1 for Four Years**

	1915	1916	1917	1918
Alabama .....	8,425	13,798	22,354	32,873
Arizona .....	4,774	7,320	12,122	19,890
Arkansas .....	5,642	8,021	14,704	28,862
California .....	123,101	163,801	212,918	243,116
Colorado .....	17,951	26,611	44,180	66,850
Connecticut ....	26,218	38,950	56,048	74,642
Delaware .....	2,894	4,924	7,520	9,655
Dist. of Columbia	8,000	10,200	13,118	21,198
Florida .....	11,366	13,123	14,220	39,216
Georgia .....	20,800	24,059	45,775	70,496
Idaho .....	3,272	7,093	12,996	24,316
Illinois .....	131,140	182,290	251,300	340,292
Indiana .....	65,500	96,915	139,138	189,433
Iowa .....	106,087	139,808	172,791	278,213
Kansas .....	50,467	74,956	114,364	154,442
Kentucky .....	11,746	19,500	31,500	47,400
Louisiana .....	3,500	10,880	20,014	31,650
Maine .....	14,300	18,600	28,951	38,499
Maryland .....	20,213	27,638	33,364	56,129
Massachusetts ..	76,832	89,133	136,790	155,044
Michigan .....	76,389	114,845	159,639	215,001
Minnesota .....	67,365	91,829	137,500	191,500
Mississippi .....	3,894	11,500	20,474	31,650
Missouri .....	50,998	76,462	107,865	146,142
Montana .....	10,706	14,520	24,585	41,896
Nebraska .....	50,000	59,140	101,201	148,101
Nevada .....	1,487	2,177	4,609	6,760
New Hampshire...	8,738	10,819	14,338	18,146
New Jersey ....	58,820	67,556	75,108	87,421
New Mexico ....	3,090	4,947	8,028	14,086
New York .....	156,173	212,844	279,406	404,247
North Carolina..	14,815	21,160	35,150	55,950
North Dakota...	17,348	24,678	41,761	62,993
Ohio .....	121,265	179,767	252,179	333,630
Oklahoma .....	7,360	25,615	52,718	100,199
Oregon .....	16,347	23,758	30,917	48,132
Pennsylvania ...	107,141	150,729	230,648	325,153
Rhode Island...	12,331	16,362	21,406	25,142
South Carolina..	15,000	14,500	19,000	36,822
South Dakota...	20,080	29,336	44,271	67,158
Tennessee .....	19,668	27,266	31,400	48,500
Texas .....	64,732	90,000	197,687	213,334
Utah .....	6,139	7,994	13,507	21,226
Vermont .....	7,613	11,499	14,251	18,550
Virginia .....	13,985	21,357	35,426	55,661
Washington ....	30,253	36,905	62,546	93,822
West Virginia...	7,217	13,256	20,437	31,306
Wisconsin .....	53,180	81,371	117,603	164,531
Wyoming .....	2,428	3,976	7,125	12,001
	1,754,570	2,423,788	3,544,952	4,941,276

**T**HE total registration of automobiles and trucks during the calendar year of 1917, the first year of the war, shows an increase over the 1916 registrations, and sets a new record. During 1917 there was a total gain in registration of 1,396,324 automobiles and trucks over 1916. This is greater than the gain of 1916 over 1915, when the increase was over a million. The nine months of war failed to stem the increase in registration, and this stands as an indication of how necessary the automobile is considered even in war days.

The total automobile and truck registration in the country as of Jan. 1, 1918, according to official figures furnished from all of the forty-eight states, is 4,941,276. This figure does not include duplicate registrations, and, of course, does not include hundreds and perhaps some thousands of cars in remote districts, all of which are not registered. In round figures there must have been very close to 5,000,000 automobiles and trucks in the country on the first day of January this year.

### One Motor Vehicle for Every 20 Persons

Taking the figures compiled from the registration departments of the states, and placing the population at 103,000,000, there is now one motor vehicle for every twenty persons in the land. A year ago there was one vehicle for every twenty-nine persons. Two years ago there was one vehicle for every forty-two persons.

The gains in registrations during the past three calendar years are:

1915 registration gains.....	686,998
1916 registration gains.....	1,070,143
1917 registration gains.....	1,396,324

The total increased registration of 1,396,324 compares favorably with the estimated output of automobiles and trucks during 1917 of 1,938,778, as computed, and generally accepted as being nearly correct. It is natural that a goodly number of cars went out of commission during the year, but not 542,000, as the difference between these figures would indicate. Part of this difference is owing to many automobiles built during the last 3 months of 1917 which were placed in storage by the makers and





Registration of passenger and commercial cars in the United States segregated by individual states.  
Eight states have more than 200,000 vehicles each

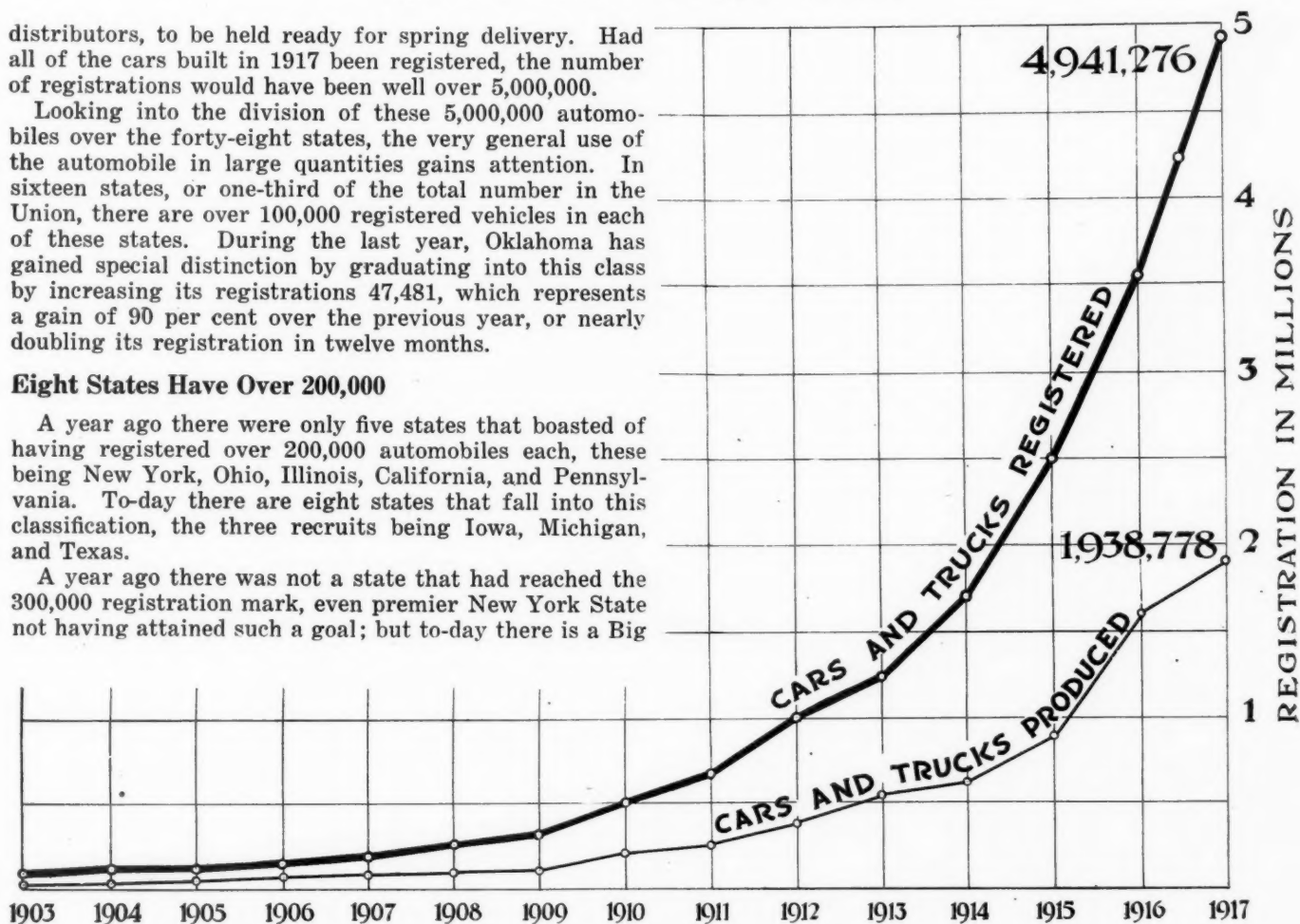
distributors, to be held ready for spring delivery. Had all of the cars built in 1917 been registered, the number of registrations would have been well over 5,000,000.

Looking into the division of these 5,000,000 automobiles over the forty-eight states, the very general use of the automobile in large quantities gains attention. In sixteen states, or one-third of the total number in the Union, there are over 100,000 registered vehicles in each of these states. During the last year, Oklahoma has gained special distinction by graduating into this class by increasing its registrations 47,481, which represents a gain of 90 per cent over the previous year, or nearly doubling its registration in twelve months.

#### Eight States Have Over 200,000

A year ago there were only five states that boasted of having registered over 200,000 automobiles each, these being New York, Ohio, Illinois, California, and Pennsylvania. To-day there are eight states that fall into this classification, the three recruits being Iowa, Michigan, and Texas.

A year ago there was not a state that had reached the 300,000 registration mark, even premier New York State not having attained such a goal; but to-day there is a Big



Since 1903, the curve of registrations of cars and trucks has been a steadily rising one until to-day it nearly touches five million. The production curve has not shown such a consistent rise

## Registration and Population

State	Pop. July 1, 1917	Cars and Trucks	Pop. Per Car
Iowa	2,224,771	278,213	8
Nebraska	1,284,126	148,101	8
South Dakota	716,972	67,158	10
Montana	472,935	41,896	11
Minnesota	2,312,445	191,500	12
North Dakota	765,319	62,993	12
Kansas	1,851,870	154,442	12
California	3,029,032	243,116	12
Arizona	263,788	19,890	13
Michigan	3,094,266	215,001	14
Indiana	2,835,492	189,433	15
Wisconsin	2,527,167	164,531	15
Colorado	988,320	66,850	15
Ohio	5,212,085	333,630	15
Wyoming	184,970	12,001	15
Nevada	110,738	6,760	17
Connecticut	1,265,373	74,642	17
Washington	1,597,400	93,822	17
Dist. of Col.	369,282	21,198	17
Oregon	861,992	48,132	18
Illinois	6,234,995	340,292	18
Idaho	445,176	24,316	18
Vermont	364,946	18,550	19
Maine	777,340	38,499	20
Utah	443,866	21,226	20
Delaware	215,160	9,655	22
Oklahoma	2,289,855	100,199	22
Missouri	3,429,595	146,142	23
Florida	916,185	39,216	23
New Hampshire	444,429	18,146	24
Texas	4,515,423	188,334	24
Maryland	1,373,673	56,129	24
Massachusetts	3,775,973	155,044	24
Rhode Island	625,865	25,142	24
New York	10,460,182	404,247	25
Pennsylvania	8,660,042	325,153	26
New Mexico	423,649	14,086	30
New Jersey	3,014,194	87,421	34
Virginia	2,213,025	55,661	39
Georgia	2,895,841	70,496	40
North Carolina	2,434,381	55,950	43
South Carolina	1,643,205	36,822	44
West Virginia	1,412,602	31,306	45
Tennessee	2,304,629	48,500	47
Kentucky	2,394,093	47,400	50
Louisiana	1,856,954	31,650	58
Arkansas	1,766,343	28,862	61
Mississippi	1,976,570	31,650	62
Alabama	2,363,939	32,873	72
Total	103,640,473	4,941,276	21

Four in this 300,000 classification, made up of New York, Illinois, Ohio and Pennsylvania. These four leaders have made large registration gains in the last year, making additions as follows:

New York added.....124,841  
Illinois added..... 88,992  
Ohio added..... 81,451  
Pennsylvania added..... 94,505

New York State still occupies a premier position, and carries the unique distinction of being the only state to have a registration over 400,000, its official figure as of Jan. 1, 1918, being 404,247.

When an analysis of the forty-eight states with regard to actual gains in registration is made, the leaders are New York, followed by Iowa, the automobile Goliath from west of the Mississippi, which has taken the leadership away from such great central states as Illinois, Ohio, Pennsylvania and Michigan. With the possible exception of Oklahoma, with its record gain during the year the State of Iowa leads in percentage of gains of the fifteen states that have the largest registrations.

Iowa, as a premier agricultural state, gives to the entire world the potent meaning of the necessity of motor apparatus for the great farming areas. There are only five other states in the Union that show a greater percentage gain and these are states of much smaller actual registration.

There is a little coterie of states that have set very high percentages of increase in registration during the year, these including Florida, South Carolina, Arkansas, Idaho, Montana, Arizona, Wyoming, New Mexico and Maryland and the District of Columbia. Florida literally ran away with itself, showing an increase of 176 per cent during the year. Last year there was sold in the state nearly twice as

## Increase in Registration

State	Increase in Cars	Per Cent Increase
New York	124,841	45
Iowa	105,422	61
Pennsylvania	94,505	41
Illinois	88,992	35
Ohio	81,451	32
Michigan	55,362	34
Minnesota	54,000	39
Indiana	50,295	36
Oklahoma	47,481	90
Wisconsin	46,928	40
Nebraska	46,900	46
Kansas	40,078	35
Missouri	38,277	35
Washington	31,276	50
California	30,198	14
Florida	24,996	176
Georgia	24,721	54
South Dakota	22,887	52
Maryland	22,765	68
Colorado	22,670	51
North Dakota	21,232	51
North Carolina	20,800	59
Virginia	20,235	57
Connecticut	18,594	33
Massachusetts	18,254	13
South Carolina	17,822	89
Montana	17,311	70
Oregon	17,215	56
Tennessee	17,100	54
Kentucky	15,900	50
Texas	15,647	7
Arkansas	14,158	96
New Jersey	12,313	16
Idaho	11,320	87
Mississippi	11,176	54
West Virginia	10,869	53
Louisiana	11,636	58
Alabama	10,519	47
Maine	9,548	67
Dist. of Col.	8,080	61
Arizona	7,768	63
Utah	7,719	57
New Mexico	6,058	75
Wyoming	4,876	68
Vermont	4,299	30
New Hampshire	3,808	26
Rhode Island	3,736	17
Nevada	2,151	47
Delaware	2,135	28
Total	1,396,324	54

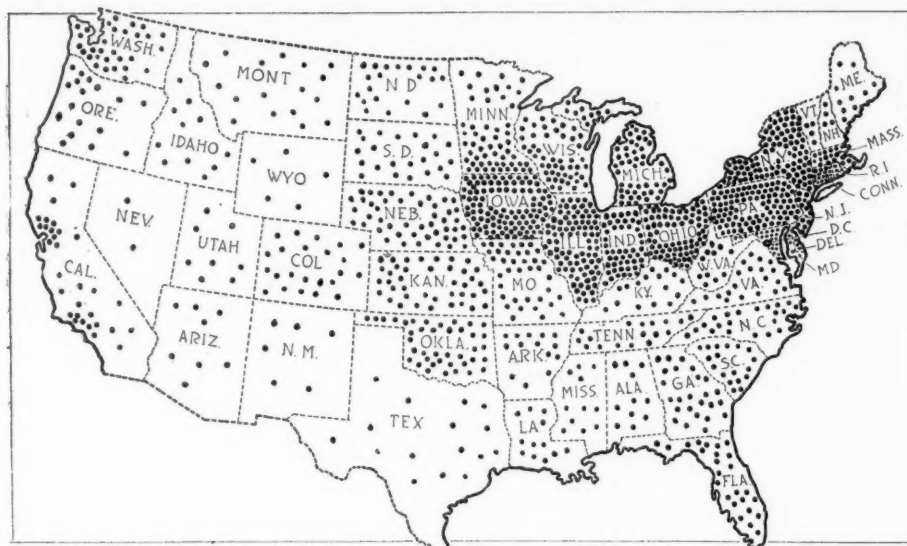
many cars as there were formerly in the state.

South Carolina nearly doubled its car population in the year and so did Arkansas and Oklahoma. Idaho might be classed in this group.

## Dealers, Garages, Machine Shops and Supply Houses in Operation

State	Dealers	Garages	Re- pair Shops	Cos. Having Supply Depts.	Job- bers	Supplies Exclu- sively	Total
Alabama	185	116	92	47	2	27	299
Arizona	124	101	63	50	..	13	199
Arkansas	214	124	76	50	..	24	323
California	1262	1412	1002	448	19	173	2457
Colorado	356	327	191	135	3	23	556
Connecticut	464	486	302	163	7	87	851
Delaware	74	70	32	23	..	6	108
Dist. of Columbia	66	56	35	10	3	23	151
Florida	254	264	168	119	2	39	474
Georgia	392	277	163	97	2	55	651
Idaho	177	126	74	66	1	16	24
Illinois	1931	1700	999	530	18	132	3063
Indiana	1002	803	377	300	10	69	1450
Iowa	1681	1374	770	690	7	69	2389
Kansas	996	850	450	352	8	34	1562
Kentucky	303	249	100	79	3	26	453
Louisiana	170	92	61	39	3	18	251
Maine	353	288	142	131	3	17	555
Maryland	230	253	124	77	2	31	420
Massachusetts	816	923	435	216	15	145	1675
Michigan	971	871	362	272	7	90	1594
Minnesota	1101	833	465	276	14	43	1547
Mississippi	133	92	49	44	..	15	197
Missouri	804	672	419	222	16	69	1387
Montana	266	217	140	96	2	14	385
Nebraska	856	695	290	239	8	23	1198
Nevada	60	60	30	20	..	5	103
New Hampshire	187	218	107	95	..	10	326
New Jersey	703	967	461	239	2	87	1468
New Mexico	95	91	39	41	..	7	154
New York	2023	2344	1178	616	15	335	4064
North Carolina	331	269	116	113	1	24	480
North Dakota	521	343	192	148	1	10	705
Ohio	1829	1464	686	513	26	148	2798
Oklahoma	459	364	155	160	3	30	719
Oregon	229	252	124	76	4	28	412
Pennsylvania	1831	1867	864	630	14	220	3082
Rhode Island	97	142	92	18	6	14	274
South Carolina	211	127	68	55	2	19	316
South Dakota	446	348	173	114	2	10	636
Tennessee	227	157	115	77	3	29	366
Texas	877	644	324	236	9	89	1464
Utah	111	74	51	27	3	13	174
Vermont	175	166	102	75	..	10	305
Virginia	291	211	128	75	2	44	456
Washington	418	353	201	108	6	48	686
West Virginia	227	155	69	66	..	14	302
Wisconsin	1085	937	438	339	8	48	1508
Wyoming	88	74	41	25	..	9	137
Territory of Hawaii	11	9	10	9	..	5	20
West Indies	27	22	4	9	..	4	41
Canada	955	860	421	223	18	82	1423
Mexico	9	11	4	2	..	2	17
Total	28,704	25,500	13,574	8,880	279	2,626	46,657





This map will give some idea of where the big increase in registrations has taken place. Each dot represents 1000 vehicles gained during 1917

While phenomenal gains in registrations have been made in these states, all of which except Oklahoma have relatively small registrations, the big substantial gains that make up the 1,396,324 increase in 1917 are found in the great agricultural states, with the

possible exception of New York. Here are a few examples of how registrations have gained in the big grain-growing states:

Iowa gained in 1917.....105,422  
Illinois ..... 88,992  
Ohio ..... 81,451

Michigan ..... 55,362  
Minnesota ..... 54,000  
Indiana ..... 50,295  
Oklahoma ..... 47,481  
Wisconsin ..... 46,928  
Nebraska ..... 46,900  
Kansas ..... 40,078  
Missouri ..... 38,277  
Washington ..... 31,276

Here is a total of nearly 700,000 increased registrations in this dozen of the leading grain-growing states. They head the list of increases in registrations, with two exceptions, New York State and Pennsylvania. They lead California, that was a close runner-up for first honors after New York. They lead Massachusetts, that shows a gain of but 13 per cent in increased registrations during the year, which is the second smallest percentage gain of the year, Texas, with a percentage gain in registrations of 8 per cent, standing at the foot of the ladder of increases. Western Texas suffered very severely from the dry weather, a fact that explains to quite an extent the small gain in 1917.

Taken as a group, the Southern States, by their increased registrations, gave evidence of the flow of

### Automobile and Truck Registrations in United States to January 1, 1918

State or Territory	Total Registration	New Registration	Registration Up to Jan. 1, 1917	Gasoline Passenger Cars in Use	Electric Passenger Cars in Use	Gasoline Commercial Cars in Use	Electric Commercial Cars in Use	Motorcycles in Use	Non-Resident Registration*	Re-Registered**	Chauffeurs Registered	Total Fees	Remarks
Alabama.....	32,873	10,519	22,354					1,240			1,631	\$187,696	
Arizona.....	19,890	7,768	12,122			1,439		868			3,453	117,643	
Arkansas.....	28,862	14,158	14,704								485		
California.....	245,866	32,948	212,918	245,866		10,765		32,489	2,750	None	14,935	2,846,030	
Colorado.....	66,850	22,670	44,180					4,504					
Connecticut.....	74,642	18,594	56,048			9,702		4,905					
Delaware.....	10,700	3,180	7,520					730		1,045		133,883	
Dist. of Col.....	21,198	8,080	13,118	20,939	267			346			59,800	83,110	
Florida.....	39,216	24,996	14,220								6,000		
Georgia.....	72,851	27,076	45,775	108,751	1800	13,000	1100	1,400	355	2,000	1,400	230,862	
Idaho.....	24,716	11,720	12,996					752	None	1400	1,181	413,929	
Illinois.....	340,292	88,992	251,300					13,750			45,000	2,237,545	
Indiana.....	192,192	53,054	139,138					10,315		2,759		1,096,106	
Iowa.....	278,213	105,422	172,791					7,684			None	2,249,655	
Kansas.....	159,342	44,978	114,364					5,599	None	4,900	None	83,258	
Kentucky.....	47,400	15,900	31,500					1,450				287,212	
Louisiana.....	31,650	11,636	20,014			3,165		382				170,000	
Maine.....	41,499	12,548	28,951	38,067	150	3,382	None	1,516		3,000		487,873	
Maryland.....	60,943	27,579	33,364	3,051		3,656	1500	5,436	1,500	3,314	15,524	807,395	
Massachusetts.....	174,274	37,484	136,790			26,964		8,727	306	19,230	51,690	1,969,813	
Michigan.....	226,693	67,054	159,639	206,380		20,313		11,386		20,157	2,476,525		
Minnesota.....	192,000	54,500	137,500	170,000	1500	120,000	11,500	15,000	None	500	15,000	334,000	Triennial Perennial
Mississippi.....	31,650	11,176	20,474								None		
Missouri.....	151,027	43,162	107,865					4,179		4,885	18,040	617,943	
Montana.....	42,749	18,164	24,585			1600		923			853	295,207	
Nebraska.....	148,101	46,900	101,201					3,500			None		
Nevada.....	6,885	2,276	4,609	6,882	3	1225		238	None	125		32,320	
New Hampshire.....	22,267	7,929	14,338	22,000	100			2,218	1,721	2,400	8,288	425,305	
New Jersey.....	141,918	66,810	75,108			9,622		13,198	28,383	126,114	177,568	1,923,164	
New Mexico.....	14,086	6,058	8,028					345			None	80,343	
New York.....	410,950	131,544	279,406			55,402		28,773	4,257	2,446	132,833	4,251,991	
North Carolina.....	55,950	20,800	35,150					1,253		None	None	321,923	
North Dakota.....	62,993	21,232	41,761					1,834				211,536	
Ohio.....	342,630	90,451	252,179					21,925		9,000		1,766,427	
Oklahoma.....	100,199	47,481	52,718					2,368	None		None	836,400	
Oregon.....	48,632	17,715	30,917	44,844	1100	3,648	140	3,400	1500	None	3,476	196,788	
Pennsylvania.....	325,153	94,505	230,648			12,952		24,567				3,268,025	
Rhode Island.....	25,142	3,736	21,406			4,065		1,133				346,117	
South Carolina.....	38,322	19,322	19,000					1,250	500	1,000	None	113,557	
South Dakota.....	67,158	22,887	44,271					1,554	None	None	None		
Tennessee.....	48,500	17,100	31,400		50		10	900	None	None	None	317,000	
Texas.....	1219,721	22,034	197,687					3,468	28	6,359	12,714	858,611	
Utah.....	21,576	8,069	13,507	18,227	100	2,500		1,385	100		1,547	106,863	Perennial
Vermont.....	20,367	6,116	14,251	18,970	7	1,262	4	758		1,817	3,655	362,541	
Virginia.....	55,661	20,235	35,426					2,135			3,530	518,566	
Washington.....	93,822	31,276	62,546	82,066		11,656		6,320		None	None	519,526	
West Virginia.....	31,306	10,869	20,437					825	None		None	861,283	
Wisconsin.....	164,531	46,928	117,603			16,000		8,479	None	None	None	57,400	
Wyoming.....	12,501	5,376	7,125					352	None	500	None		
<b>Total.....</b>	<b>5,085,959</b>	<b>1,541,007</b>	<b>3,544,952</b>	<b>946,043</b>	<b>1,977</b>	<b>210,318</b>	<b>2,154</b>	<b>254,373</b>	<b>40,400</b>	<b>104,283</b>	<b>590,963</b>	<b>\$34,501,371</b>	

NOTE.—Steam cars and trucks are included with the gasoline vehicle statistics, as segregation is not carried out by registration officials. \*Number of cars registered owned by citizens of other states. \*\*Number of vehicles re-registered, owing to transfer of ownership, etc. ....Statistics not available. †Estimated by Secretary of State.

## Vehicles Per Capita for 3 Years

	1915	1916	1917
Alabama	168	104	72
Arizona	34	19	13
Arkansas	215	118	61
California	18	14	12
Colorado	36	22	15
Connecticut	32	22	17
Delaware	43	28	22
Dist. of Columbia	35	28	17
Florida	67	63	23
Georgia	117	62	41
Idaho	59	33	18
Illinois	33	25	18
Indiana	29	20	15
Iowa	16	13	8
Kansas	24	16	12
Kentucky	121	76	51
Louisiana	167	108	57
Maine	41	27	20
Maryland	49	41	24
Massachusetts	41	27	24
Michigan	26	19	14
Minnesota	25	17	12
Mississippi	168	95	62
Missouri	44	32	23
Montana	31	19	11
Nebraska	21	13	9
Nevada	48	23	16
New Hampshire	41	31	24
New Jersey	43	39	34
New Mexico	82	50	30
New York	48	37	26
North Carolina	113	68	44
North Dakota	29	18	12
Ohio	28	20	16
Oklahoma	83	42	23
Oregon	35	27	18
Pennsylvania	56	37	27
Rhode Island	37	29	25
South Carolina	111	86	45
South Dakota	23	16	11
Tennessee	84	73	48
Texas	49	22	21
Utah	54	32	21
Vermont	32	26	20
Virginia	102	62	40
Washington	41	25	17
West Virginia	103	68	45
Wisconsin	31	21	15
Wyoming	45	45	15

weather due to cotton, sugar and timber. They literally, with the Lone Star State excepted, represent a solid South in big gains, all running over 50 per cent, if we overlook Texas and Alabama, the latter showing 47 per cent only. The roll of honor begins with Florida running wild at 176 per cent gain and followed by the list as follows:

	Per cent gained	1917.
Florida	176	24,996
South Carolina	89	17,822
Oklahoma	90	47,481
Arkansas	96	14,158
Maryland	68	22,765
North Carolina	59	20,800
Louisiana	58	11,636
Virginia	57	20,235
Mississippi	54	11,176
Georgia	54	24,721
Tennessee	54	17,100
West Virginia	53	10,869

Kentucky	50	15,900
Alabama	47	10,519
Texas	7	15,647
District of Columbia	61	8,080

This represents a total increase of registration in these Southern States of 296,779, or scarcely one-half the gain in the agricultural states previously analyzed. The phenomenal gains give indication of the still greater ability of these Southern States to absorb automobiles and trucks during 1918. With continued prosperity in the South under the stimulation of war it will not be surprising if 1918 shows a registration increase in these states of 500,000. All during the present winter the South has been asking for cars and there have been factory driveaways on a scale never contemplated before. For the first time the South has given indication of its automobile-buying strength.

Other groups of states to profit under war régime are the mining and oil states. In this group those states such as Oklahoma which possess the profitable combination of oil, and crops as well as live stock give evidence of the increased wealth under war.

In the mining group of Western States, comprising Idaho, Montana, Wyoming, New Mexico, Arizona, Utah, Colorado and Nevada, the gains are very nearly as spectacular as in the solid South. Here the gain percentages run well over 50 with the single exception of Nevada, which, like Alabama in the South, fell below this mark. Idaho gets the leadership, with 87 per cent gain, which is nearly on a par with Oklahoma, which profited so well from oil, agriculture and live stock.

The percentages of gains and the net increases in registrations in this Western group of mining states are:

State.	Per cent gained.	
Idaho	87	11,320
New Mexico	75	6,058
Montana	70	17,311
Wyoming	68	4,876
Arizona	63	3,768
Utah	57	7,719
Colorado	51	22,670
Nevada	47	2,151

Total.....79,793

The six New England States as a unit show very low registration gains over the 1916 calendar year, the percentages all running under 50, in fact, the highest percentage is 33, which honor is shared by Connecticut and Maine, whereas the smallest gain, namely 13 per cent, went to the pioneer motoring State of Massachusetts. The New England gains by states in

## Statistics by Years

Year	Registration	Production	Value, Output
1911	677,000	210,000	\$262,500,000
1912	1,010,483	378,000	378,000,000
1913	1,253,875	483,000	425,000,000
1914	1,736,790	573,114	465,042,474
1915	2,471,595	892,618	691,778,950
1916	3,544,952	1,617,708	1,274,625,864
1917	4,941,276	1,938,778	1,660,134,976

percentages and actual registrations are:

State.	Per cent gained.	
Maine	67	9,548
Connecticut	33	18,594
New Hampshire	26	3,808
Vermont	30	4,299
Rhode Island	17	3,736
Massachusetts	13	18,254

Total.....58,239

Compared with the calendar year of 1916, the entire New England territory did not show gains in 1917, as might have been expected. The percentages of registration gains in 1916 were much higher. Maine had 55 per cent, Massachusetts had 53 per cent, as compared with 13 per cent last year. The only New England State that showed a bigger percentage increase in 1917 than in 1916 was Ver-

(Continued on page 573)

## DISTRIBUTION OF CAR, TRUCK AND ENGINE MANUFACTURERS IN THE UNITED STATES AND CANADA

State	Auto-mobiles	Commercial Vehicles	Engines	Total
California	5	14	..	18
Colorado	1	..	..	1
Connecticut	4	3	2	8
Delaware	..	1	..	1
Dist. of Colum.	..	1	..	1
Georgia	..	3	..	3
Illinois	19	50	4	68
Indiana	24	16	5	41
Iowa	..	9	..	9
Kansas	1	2	..	3
Kentucky	2	3	..	4
Louisiana	1	1	..	2
Maine	..	1	..	1
Maryland	1	1	..	1
Massachusetts	5	14	..	15
Michigan	43	44	17	99
Minnesota	6	35	..	38
Missouri	4	11	..	14
Nebraska	1	2	..	3
New Hampshire	..	1	..	1
New Jersey	4	7	1	11
New York	17	43	8	64
North Carolina	..	1	..	1
Ohio	32	51	7	81
Oklahoma	1	1	..	1
Oregon	..	29	..	29
Pennsylvania	10	29	5	39
Rhode Island	..	1	..	1
South Carolina	1	..	..	1
South Dakota	..	1	..	1
Texas	1	1	..	2
Virginia	2	1	..	3
Washington	2	4	..	4
West Virginia	2	2	..	2
Wisconsin	6	24	9	37
Canada	20	16	..	29
Total	215	394	58	608



# Guiding the Workman's Personal Expenditures

Ford Reduced Turnover 350 Per Cent by the Simple Psychology of a Peaceful Mind as a Result of Domestic Content

By C. J. Shower

**T**HERE are three ways by which industries can permit employees to share in their profits. The first is to issue stock and allow them to buy it at the inside, rock bottom prices. In this way the employee can share in the prosperity of the company in proportion to the interest given his work. There is no human element connected with it. The employee in this method is, in a sense, an equal to his employer.

The second way is to put money into gymnasiums, libraries, lunch rooms, swimming pools, etc., for the benefit of employees, the employer believing that he can better and more economically spend the money for their welfare than they can themselves.

The third way is to place the money right in the hands of the employee and let him use it as his own judgment dictates. This latter is Henry Ford's view. But there is danger in this method if no guidance accompanies it. Some men cannot use good judgment in the expenditures of money; they are unable to spend it wisely and constructively.

The plan as worked out by Henry Ford has indeed been successful. Statistics show that it has reduced turnover from 370 per cent to only 16 per cent in one year. This is worthy of note, for one of the big problems the employer has is reducing the cost of hiring and training men.

In 1913 the Ford Motor Co. suffered an enormous turnover. There was some reason for that and the company took steps to find the cause. After a long investigation and an analysis of the situation it was found that there were three destroying elements to contend with:

- 1—The men were working too long hours.
- 2—Their wages were too small.
- 3—Housing conditions were unsatisfactory.

Any one reason would tend to make an employee leave and seek work elsewhere. It is obvious that a man would rather work shorter hours for the same pay. He would have more leisure time. If he can obtain more wages elsewhere for the same hours of employment, he will change. And if he is not entirely satisfied with his home surroundings he will move and later he will want to find work nearer his home.

Years ago, when industries were small, there was a close contact between the employer and employee. The employer knew nearly every one of his men more or less intimately and knew his requirements. There was more of a personal element in the connection than now, when industries have grown to large proportions and it is impossible, perhaps futile, for an employer to come in personal contact with such great numbers—30,000 to 50,000 individuals. For this reason it was advisable to organize at the Ford plant a special department whose function it is to keep in personal relation with the employees.

This department is the outcome of the investigation made



Above—The Employment Department, showing men filling application blanks. Right—Employees attending the outdoor Ford English school

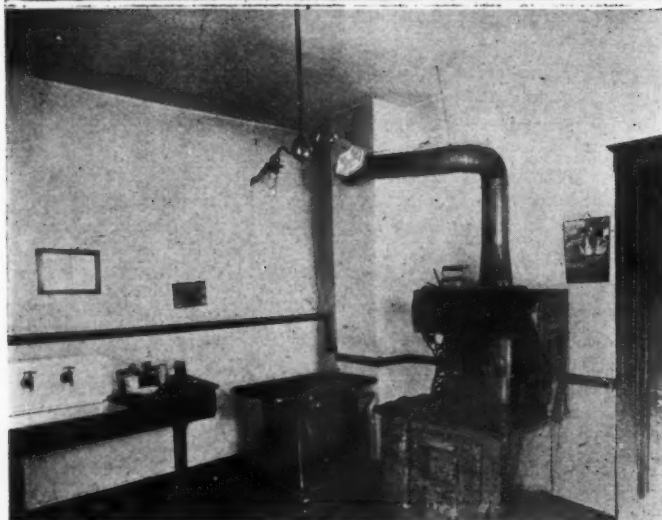


### Before and After Views of Ford Employees' Homes

*These pictures illustrate the transformation wrought in the home life of the workmen by the Ford company's profit-sharing system*



*Housing conditions as they were found and the new home of a profit-sharer*

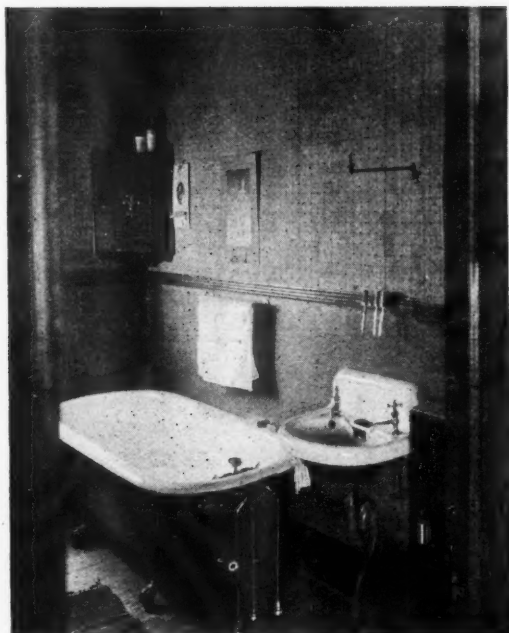


*A typical kitchen as it was found during the investigation and as the profit-sharing plan transformed it*



*As many as four beds were found in one room by the investigator; the lower picture shows how it looks now*





A result of the new régime



A typical dining room in a profit-sharer's home

several years ago and the results thus far accomplished are praiseworthy. It aims:

1. To improve a man's tastes and at the same time increase his earning power;
2. To teach a man to use his income in a constructive manner;
3. To put a man into a right relation with his family;
4. To put a man into right relations with his community;
5. To put a man right with his work and his employer;
6. To fit the foreigner to become a citizen and to encourage him to do so;
7. To give the man who is down and out a chance to come back.

#### Shorter Hours—More Pay

The three causes of dissatisfaction on the part of the men, it is believed, have been removed. The working hours have been shortened to 8 hr. a day and the minimum wage was set at \$5 a day. Steps have been taken to improve the housing conditions. All three have resulted in very materially reducing the turnover.

An idea of the commendable work done by this department can be gained by reciting a few statistics: In November, 1912, the factory was working on a 9-hr. basis, and was paying about sixty different rates of wages. During that month in order to maintain a working force of 8820 men it was necessary to hire 3732 men, or 42 per cent of the total working force, and during that time 4126 or 46 per cent of the force left its employ. A year later, due to the organization of the Profit-Sharing Plan, it was necessary to hire only 1085 men to maintain a force of 13,500. This shows a percentage of only 8 per cent.

January 12, 1914, the profit-sharing plan was put into effect. Two months later statistics show that the percentage of turnover was decreased still more. The factory had been working on a 9-hr. basis until this time when it adopted an 8-hr. working day. With men being paid higher wages and working shorter hours a marked effect was noted on the production. Almost immediately with these changes an increase was felt.

In the motor department with relatively the same number of men there was an output of 7200 parts in 8 hr. as against that of 6125 in 9 hr.

The radiator department jumped their output from 750 in 9 hr. to 1300 in 8 hr.

In the fender department where 38 fenders were produced in 9 hr. heretofore, the same group of men increased the number to 50 within the 8-hr. day.

Where it took 65 men formerly to produce 800 gasoline

tanks in 9 hr., 60 men in the 8 hr. made a total of 1200. Increases were noted in other departments.

In 1913, 52,445 entered the employ of the company and 50,488 left. Note that a number nearly equal to the total force departed. The cost of hiring and fitting each of these men for a job and the expense of firing him have never been definitely determined, but in any event it is exceedingly costly. Some men place the figure as high as \$50 per man. This is prohibitive and if any means can be devised to reduce this excessive cost, it is to the advantage of every manufacturer to do so. To-day if the Ford company wishes to increase its working force 100 men only 136 men need be hired, while 5 years ago it was necessary to hire 963 to accomplish the same results. This means that only one-seventh as many men need be hired to get the same increase.

#### Rules for Profit Sharers

Now in order that a man may enjoy a share in the profits of the Ford company he must comply with certain rules and regulations as laid down by the institution. When this profit-sharing idea was first formulated it was readily seen that it would attract droves of men from other factories and from other cities. To prevent such a catastrophe it was necessary to make a strict rule that no one could secure work at the Ford plant that was at the time employed in another factory. And it was also made clear that no person was to be hired who lived in the city for a period less than three to six months. This first stipulation discouraged an exodus from other plants, while the latter gave little encouragement to the newcomers to the city in search of a soft job. To be entitled to any share of the profits an employee is put on six months' probation. If after that time he has shown that he is using his money in a wise manner and qualifies in other ways, he is at once put on the profit-sharing list. But he must be over 18 years of age before he is put on this list. If he is younger, he is not entitled to any profits unless he has someone solely dependent upon him.

This Welfare Work is done by several departments, each of which takes care of one phase of the work, thus: real estate matters, garnishments, legal matters, etc. But it must not be understood that these divisions are entirely separate; they are all co-ordinated and it is difficult to draw a dividing line.

The work, however, is divided. There are two ends, the outside and the inside:

The outside men, formerly called investigators but now termed advisers, investigate the housing condition of the employee, whether or not he practises thrift, whether he is

(Continued on page 547)

# The Mechanics of Tractor Spring-Mounting

## An Analytical Investigation of Effects Produced When Tractors of Different Types Pass Over Rigid Obstacles

By E. Goldberger

*Efficiency Engineer, The Packard Motor Car Co.; formerly Assistant Chief Engineer, The Holt Mfg. Co.*

LET us suppose a tractor wheel climbing over an obstacle. If the vertical distance which the wheel is lifted in unit time is large, we say the vertical velocity is large. Vertical velocity = vertical motion in unit time. To impart velocity to a body is to accelerate it. Vertical acceleration = change of vertical component of velocity in unit time. Now, to create such an acceleration requires a force. Experience has taught that the force required to accelerate a body is equal to the product of the mass of the body by the acceleration in unit time.

If the obstacle is hard and strong enough so as not to crumble under the weight of the machine, then it will force the tractor upward, exerting upon the wheel at the point of contact between wheel and obstacle the force required to create that upward motion; hence, if we know the path followed by the wheel we can easily determine the force exerted upon the wheel at any moment.

In Fig. 1 is shown a wheel crossing an obstacle which we will suppose to be perfectly rigid. The shape and size of the obstacle will be considered constant throughout the following investigation, in order to make it easier to compare the effects upon different types of tractor carrying members.

The first curve, marked  $s-t$ , shows the travel of the point through which pressure due to the weight of the machine is transmitted to the ground, or, vice-versa, the shock from the ground to the machine. If the tractor moves at a uniform speed in a horizontal direction, then the horizontal scale of this curve can be made to represent either the distance or the time of travel, while the vertical scale represents the lift of the center of the forces transmitted to or from the chassis and machinery. The full-drawn  $s-t$  curve supposes a rigid connection between center of wheel and chassis.

### Measuring Vertical Travel

By subdividing the horizontal axis into equal parts, which we may call units of time, and drawing verticals through these points, we can easily scale the vertical travel during every one of these units of time and consider it the average velocity for that small period. Plotting these values in a new curve, we obtain the  $v-t$  curve, which represents the vertical velocities of the wheel and that part of the tractor which rests on it. The velocities will be positive while the tractor is being raised and negative while it is descending.

Following the same process, *i.e.*, subdividing the horizontal axis into units of time and scaling the change in vertical velocities, then taking the averages during the small periods and plotting them in the new curve at the top of the graph, we obtain the  $p-t$  curve, which repre-

sents the vertical acceleration of the wheel and chassis.

To find the forces that act upon the wheel, other than that due to the weight it carries, it is only necessary that we read these lengths in the correct units for acceleration and multiply them by the mass of that part of the tractor which rests upon the wheel axle. For our graphic illustration it is advantageous to move the zero line down a distance corresponding to the gravity acceleration, as we can then read both the acceleration force while the tractor is moving over level ground and the increase or decrease of same when it is meeting an obstacle. Since the mass of the body resting on the axle is constant, the  $p-t$  curve also illustrates the actual forces in play. We note the following:

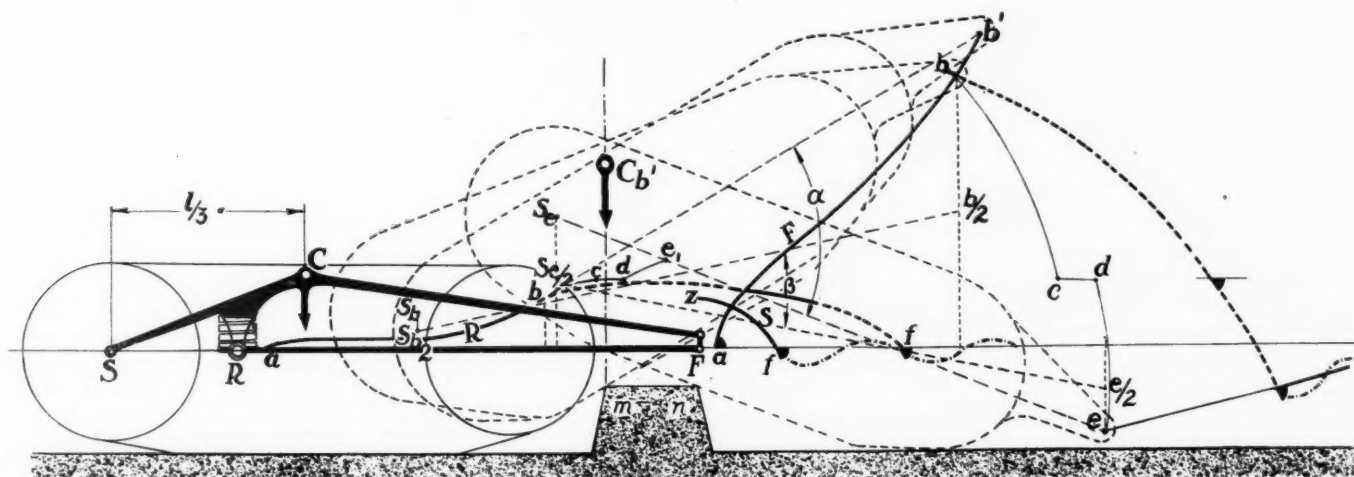
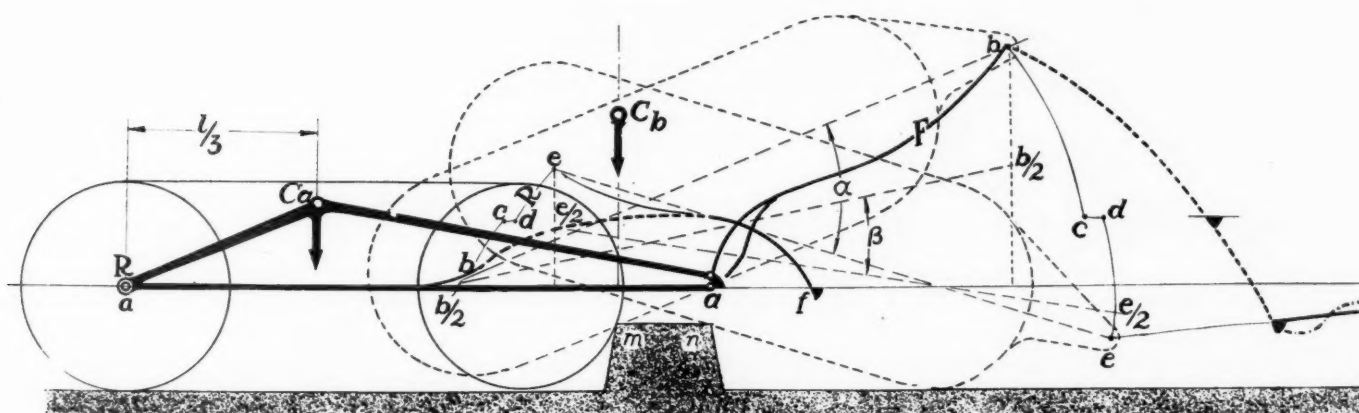
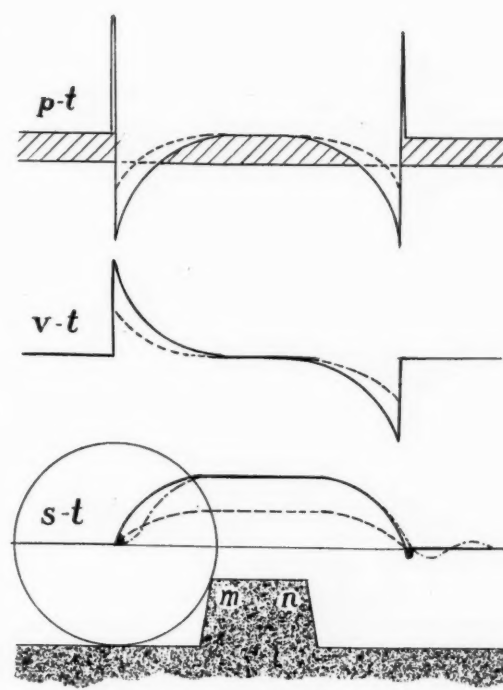
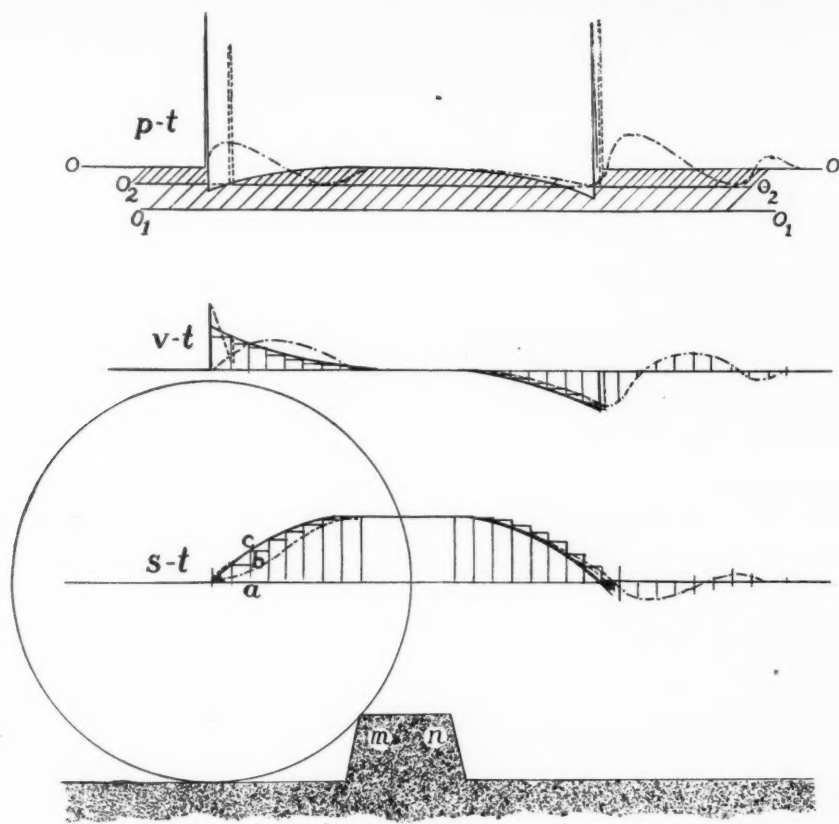
### Impact Force on Rigidly Supported Wheel

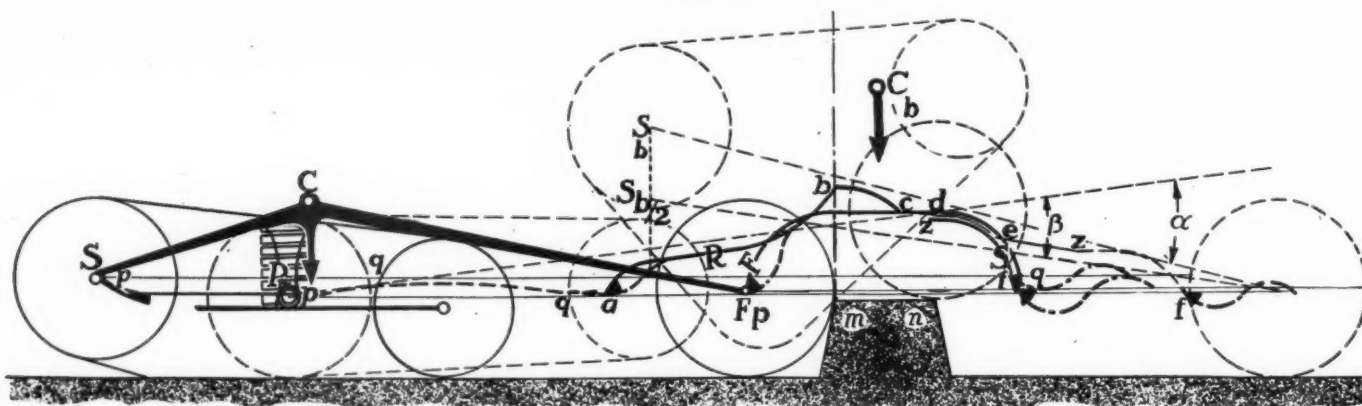
If both tractor and ground are supposed to be perfectly rigid, the moment the wheel hits the obstacle, an unlimited upward force acts upon the machine. This force disappears just as quickly as it appeared, and for a moment the tractor loses contact with the ground. The pressure due to weight reappears slowly until the wheel reaches the top of the obstacle. During the descent, the weight disappears slowly again and when the wheel hits the ground it is struck a quick upward blow, the force disappearing again quickly. Not only do these forces attain high values, but they change in value very rapidly, and in consequence they act upon all parts and joints of the machine, not like the pressure of a hydraulic press but like the blows of a hammer. All curves, *i.e.*, those of motion, velocity and acceleration, and, hence, force and impact, are identical whether the wheel is going up or down.

If the traveling speed of the tractor is doubled, the unit of time on the horizontal axis will become a half unit, hence, while the vertical motion is not changed the unit for velocities (used in measuring the  $v-t$  ordinates) is halved, which means that the vertical velocities are doubled. In the same way we find that the acceleration and the accelerating forces will be quadrupled or increased as the square of the tractor speed.

If the tractor speed is sufficiently high to cause the wheel to lose contact with the ground altogether, due to the blow from the rigid obstacle, then the tractor in coming down to ground again will be dealt another blow, which, however, will not be as severe as the previous one. Not only does the number of the blows increase with increasing speed, but the severity of the impact increases without limit, the dynamic energy being the product of mass by the square of vertical velocity. It is different while the tractor is descending the obstacle. First of all there will be no repeat blows; then, there being no downward force acting on the body, other than gravity, the







Graph 5—Type C Creeper

accumulated dynamic energy cannot increase beyond that represented by the product of weight and height of fall. The dotted lines in Graph 1 represent the  $s$ ,  $v$  and  $p-t$  curves while the body is off the ground.

With obstacles that are not rigid conditions are somewhat changed. Before the force reaches its peak, due to the reaction working upon the non-rigid obstacle, it will either crumble down or compress, hence the  $s-t$  curve will look somewhat like the dot-and-dash curve on the ascending member. The  $v-t$  and  $p-t$  curves will also be changed and will have no indicating blows.

We also note that any sudden break in the curvature of the  $s-t$  curve corresponds to a blow in the  $p-t$  curve and the greater the change in direction of the  $s-t$  curve (all other conditions being identical) the harder the blow will be. This we shall use later in comparing different types of wheels with respect to the blows that occur.

Graph 2 represents a wheel of half the size as the one in Graph 1, passing over the same obstacle. It is readily seen that the angle in the  $s-t$  curve is greater. So are the vertical velocities and accelerations, which are here drawn to the same scale as in Graph 1.

If the two front wheels of a tractor are connected by a front axle which itself is pivoted on the frame, then when one wheel crosses an obstacle the frame resting on the pivot will be raised only half as much as the wheel; with this reduction in the rise, the angle, velocities, impact, etc., are also halved. With one front wheel rigidly connected to the chassis the blows transmitted are twice as large as with two wheels on a pivoted front axle, provided one wheel passes over an obstacle and the other wheel runs on the level ground. Any good tractor driver will prefer to cross ditches at an angle than straight on.

Since the impact increases with the mass of the body, a heavy tractor is at a great disadvantage as far as force of impacts and durability are concerned. However, the most potent means of decreasing impact forces are a decrease in the tractor speed and changes in the  $s-t$  curve. The first method is not economical in a general purpose tractor, and where we have to run over rough ground spring mounting is the only practical solution.

#### Impact Force on Spring Mounted Wheel

The dot-and-dash curves in Graph 1 show the effect of spring-mounting tractors. To accelerate the body of the tractor upward requires a very large force, which is transmitted through the connection between wheel and frame, but if a spring is interposed the force of the blow to the wheel will first compress the spring. In the  $s-t$  curve  $a-c$  is the distance the wheel center has been raised up to a certain time;  $b-c$  is the distance the spring has been compressed, so the heavy chassis has been lifted only a distance  $a-b$ . From the  $p-t$  curve we can see that the pressures that reach the chassis will be much smaller

and change only gradually. No blow comes upon the heavy chassis and the mechanism of the machine either in the ascent or the descent. Further, the ascending and descending,  $s$ ,  $v$ , and  $p-t$  curves are no longer identical. Of course, if a certain spring  $s-t$  curve be chosen there still remains the problem of adapting the spring to the curve.

#### Impact on Creeper Tractors

After having thus far considered the principles of spring mounting and their application to wheel tractors, in the following these considerations will be applied to three distinct types of creeper tractors. The following will suffice to describe these types:

A. Two tracks without front wheel; weight of main frame transmitted to the track sub-frame through the rear axle and in front through a balancing bar pivoted at the middle on the main frame and connected on its ends to the front side of the sub-frames. Intermediate links make up for the unequal travel of the ends of the balancing bar and the sub-frames when crossing obstacles.

A<sub>1</sub>. Front balancing bar replaced by leaf spring.

B. Two tracks without front wheel; weight of main frame transmitted to sub-frames in the rear through a special, rigidly mounted connecting shaft, and in front the same as on A. It is to be noted that there is no connection between the rear axle and sub-frame, and that the track drive sprocket under normal conditions has no contact with the ground, hence does not carry any weight.

B<sub>1</sub>. Springs transmit the weight in the rear from main to sub-frame, instead of a rigidly mounted connection; in front there is a solid bar or leaf spring.

C. Two tracks and one front wheel. The weight of rigidly mounted connecting shaft placed about in the middle of the sub-frame, and in front to the ground through the front wheel.

C<sub>1</sub>. Same as C, with the exception that instead of the rigidly mounted connecting shaft, a spring makes a flexible connection between the main frame and the sub-frame.

All the above chassis have three-point suspension. Attention is called to the fact that in the following investigation all three tractors are reduced to the same length, i.e., the center distance from the rear axle to the front supporting member, be it a solid bar, spring or front wheel, is identical on all three types. The main frames with all their parts are supposed to be identical on all types, consequently the center of all external forces acting on the machine was kept in the same point, at one-third the wheel base length ahead of the rear axle. This is not the center of gravity of the machine standing still, but the center of all forces, including that due to weight, draw bar pull (taken at 60 per cent of the actual weight)



and its reaction and the adherence of the track to the ground. This is substantially the location of this center on tractors of the described type.

Fig. 3 refers to the Type A creeper. In riding over an obstacle of the shape shown, the front supporting point will describe the curve *F*. Portion *a-b* corresponds to the track rising until the resultant of all external forces through the above-mentioned centers falls in front of the tractor-supporting base on the ground. This point passed, the tractor balances on the obstacle and the front end drops to the ground (portion *b-c* of the curve); riding on the level top of the obstacle gives the curve *c-d*; finally the resultant force advances beyond the front edge of the obstacle, when the track will decline until its front touches the ground (curve *d-e*). During the last period, the rear part of the track, running down on the edge of the obstacle, gives the portion *e-f* of the curve. In the meantime the rear supporting center describes the curve *R*, the small letters corresponding to identical track positions on front and rear curves.

These curves would be correct if the tractor did not progress at all while dropping along *b-c* and *d-e* due to gravity. Actually the curves followed by the supporting points during this period will look somewhat like the heavy dotted line, and the greater the traveling speed the more these portions will be drawn out.

The heavy full line portions of the curves apply, whatever the traveling speed may be, assuming, of course, that the obstacle is rigid enough to resist the pressure without crumbling or changing its shape.

These curves were also drawn for the tractors of the B and C type with exactly the same restrictions in mind as with the A type, while the track starts to climb over the obstacle, the rear connection point *R* rises over above its normal level, while the sub-frame rear end still maintains contact with the ground. If the resultant of the external forces remains in front of point *R*, then the center *S* of the drive sprocket will always float over the ground, but if it falls behind point *R*, the drive shaft will drop until the sprocket supports part of the tractor weight. For tractors B and C the first case holds true. Since the second case, if it occurs on fairly level ground, is really due to a mistake which a good tractor designer should know how to avoid.

### Conclusions

Let us now consider the curves and draw conclusions in regard to the impact on the tractor.

The creeper of the A type with rigid connection in passing over the obstacle will be hit once severely in the front joints, while starting the ascent, and once or twice (according to whether the tractor remains on the higher level or drops again to the lower one) during the fall. These last blows will be somewhat lighter, since they will be due to the free fall of the front part of the chassis; counterbalanced by the simultaneous lifting thus reduced, the blow will be lighter. No impact will occur in point *R* during the ascent, and only one during the descent. Since the whole tractor body is now coming down, the blow will be somewhat stronger than in front. By spring mounting the front alone not all the possible shocks are eliminated.

The contour of the tractor is softly outlined for both when in the highest and lowest positions while both tracks cross the obstacle. The dot-and-dash curves are half as high as the full curve, and represent the travel of points *F* and *R* on the axis of the tractor midway between left and right track of the chassis, when one track is crossing the obstacle while the other one is moving on level ground.

In Type B creeper the front connections are the same

as those of the A type, and so are the conditions determining the motion. The rear connection, however, presents a new feature. As previously stated, the whole weight of the rear part of the tractor usually is transmitted to the sub-frame and then to the ground through point *R*, and this is the case during the ascent over an obstacle, but when the tractor is descending from the obstacle, the sprocket *S* comes slowly in contact with the ground (through the track directly) and carries part of the tractor weight, thus entirely relieving point *R*. When point *S* reaches its usual level it is floating again, and the blow occurs in the *R* connection, thus relieving the sprocket axle shaft.

By replacing the rigid connection in *R* with a spring connection, and spring-mounting the front rocking member, this tractor can easily be protected against shocks. The extreme tractor portions as well as points *F* and *R* of the tractor chassis when only one of the tracks meets an obstacle are indicated in the same way as for the A type.

### Creeper Tractor with Front Wheel

With Type C creeper two blows occur in the front wheel, one during the ascent and the second during the descent. As previously stated, the first impact increases with the square of the speed without limit, while the second blow is limited by the energy represented by the product of mass of the front part of the machine by the height of the obstacle. Connection *R*, if rigid, will go through similar conditions as those described with Type B, except that when the front wheel starts the ascent it lifts point *B*, which is rigidly connected to the main frame, the weight of the rear portion of the frame being transmitted to the ground through the rear axle shaft, and without passing through the sub-frame. This results in a shock. By spring-mounting points *R* and *F* these shocks are prevented.

Besides the shocks that have a direct influence upon the durability of a machine, there is also a surging action—that plunging and heaving while passing over an obstacle which, even though a tractor or a "tank" is not destined for joy riding, it is best to avoid whenever possible.

The extreme positions of the tractor while crossing the obstacle have been outlined for all three creeper types, and it is found that if both tracks cross the obstacle simultaneously, the maximum angles between these positions are as follows:

Type	A	B	C
$\alpha$	40°	53°	22°

These angles for Type C can be made still smaller by using two front wheels on an axle pivoted at the center, in place of a single front wheel, as considered above. The problem then resolves itself into one of design and not even a difficult one if approached in the right way.

Among American farm tractors of the wheel type only the Wallis is spring-mounted. The Cleveland tractor is a creeper type described above under A, having only the front spring-mounted. A tractor of the B type was built in 1916 by the Holt Company in Peoria, Ill. The rear was spring-mounted, but the front had a rigid connection, though, as shown above, it needs spring-mounting more than the rear. This tractor landed in the "morgue" of the plant after only a few trips.

Type C tractor has a representative in the Holt large size. However, in the Holt caterpillar the center of the external forces comes at what was above proven to be not the most desirable place. Also, instead of having the track sub-frame loaded by the main frame in one point (one spring) it has two rather widely spaced springs, which is of no advantage.

# Heated Passage Vs. Hot-Spot System

Polymerization a Limiting Factor in Heated-Passage Method—Progressive Evaporation Always the Case

By Percival S. Tice

THE evaporation of fuel in the intake system of an engine must of necessity be a progressive process. The liquid must be brought up to evaporating temperature, and, following this, heat must be made latent in it to bring about its change in state. This is true whether heat is applied at an increasing rate along the length of a passage, for instance, or whether the liquid is brought directly and at once into contact with a source of heat sufficient to evaporate it. Considering that all petroleum fuels are comprised of mixtures of several substances having among them a considerable range of boiling temperatures, from initial to final, the inherently progressive manner of evolution of the vapor is self evident.

Beyond this point the two cases are not directly comparable, since the conditions that must surround each of them, considering that complete evaporation is secured in each case, are widely different.

In the case of the comparatively small bore heated passage of considerable length, the length being necessary to provide a requisite area of heat transmitting surface, it is impossible to maintain the liquid fuel in entrainment in a globular condition. The walls must be wetted in order to utilize the heat transmitting surface which they provide. Here the process is progressive beyond that extent inherently necessary. As the fuel enters this heated passage it exists as a homogeneous mixture of the several substances comprising the fuel. As it passes along it is subjected to distillation and becomes increasingly richer in the higher boiling components as it approaches the discharge end of the passage. If the tube is long enough and provides sufficient surface there will be a point in its length beyond which none of the fuel will exist as liquid. Picture this process going on continuously during operation of the engine, the entrance of the passage containing the whole fuel as liquid, with a progressive diminishment of liquid content and a progressive enrichment of that content in high boiling fractions, along the useful length. Obviously the temperature gradient along the length of the passage will be an inverse of its liquid content. This seems on the surface of things to be an orderly and wholly desirable state of affairs.

Those who have investigated petroleum fuels by fractional distillation know that at the end of the run there always remains a portion of the fuel as residue in the still. Usually we are content to permit the last 5 to 8 per cent so to remain, in order to prevent the fouling of the still by deposition of solid matter which occurs when the sample is evaporated to dryness. Further, and particularly with heavy fuels, as kerosene, the relative amount of residue or of solid matter depends upon the rate and manner of conducting the distillation. Suitable precautions minimize the residue. Also, in the case of kerosene particularly, the unsaturated hydrocarbon content is quite appreciable; and it is well known

that among these substances polymerization or formation of resinous condensation products occurs under these conditions. These latter leave a considerable and very obnoxious solid deposit when treated to dryness.

The result of this is that with the heated-passage method of progressive evaporation all this residual matter and whatever polymerization products may have been formed are brought to dryness within a comparatively small portion of the length of the passage. The obvious result is a deposition in the passage of solid matter. This reduces its efficiency as a heat transmitter, and increasingly reduces the capacity of the passage. Naturally, the smaller the passage bore the sooner will it be choked to an extent to interfere with the functioning of the engine.

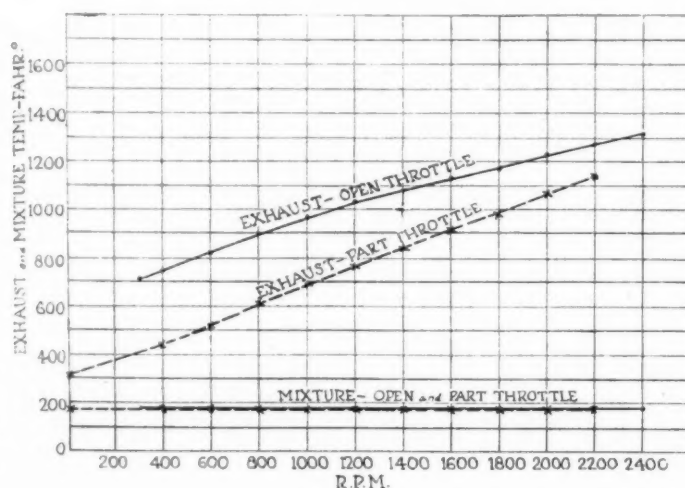
## Choking Depends on Fuel

It has been my experience with several structures embodying the heated-passage method of vaporization that this choking with solid deposits depends largely for its rate upon the fuel that is used, that is, upon the composition of the fuel as determined by its source and method of production, though it proceeds inevitably with all petroleum fuels heavier than gasoline. It is within my experience that 10 days' continuous operation on a certain brand of kerosene caused the practically complete stoppage of a 3/8-in. bore passage.

Naturally, the more nearly constant the conditions surrounding the operation of the engine, particularly with respect to speed and load, the more rapidly will serious deposition occur, since then the process of evaporation is completed more nearly continuously within a smaller portion of the length of the passage. The deposit is thus localized to a greater extent than is the case where much throttle manipulation occurs. Under this latter condition the exhaust temperature varies widely, and consequently so does the length of passage required to complete evaporation. Maintenance of a suitable and adequate heat supply to the exterior walls of the passage, to insure that evaporation be complete under all conditions without undue superheating under certain of them, is one of the really serious problems when it is attempted to supply a flexibly operating engine with fuel vapor from a heated passage or vaporizing tube.

Usually it is attempted to be met by use of a thermostatic or manual control of the mass of exhaust permitted to circulate about the vaporizing passage.

Turning to a consideration of that method wherein the evaporation is caused to be completed in one spot, as it were, by direct and immediate contact of small masses of liquid with walls sufficiently heated, the conditions are found to be considerably different from the foregoing. First, if the fuel is evenly distributed over the heated surface all portions of that surface perform equally, i.e., there is no tem-



Exhaust and mixture temperatures in a 4-cylinder engine operated on kerosene



perature gradient within the system other than that existing between the heat collecting and heat dissipating surfaces of the walls upon which the liquid is thrown. As must occur, whatever the structural method, the liquid is progressively heated to its several boiling points and absorbs those amounts of heat necessary to the evaporation of its several components. The point of distinction between a successful example of this method and the heated-passage method of the foregoing lies in the fact that in the latter the fuel is distributed over the whole of the available surface in a condition of mechanical division such that each small mass of liquid absorbs the heat necessary for its evaporation from the particular small wall area with which it comes into contact within so small a space of time that it has left that surface before another small mass of liquid appears to make use of that surface. In other words, each unit of surface handles at any one time only its corresponding portion of the total fuel supplied.

Obviously the prime consideration in a utilization of this method lies in the mechanical division or preparation of the liquid before its contact with the vaporizing wall. With this phase suitably carried out, and with the provision of sufficient heated wall area, the vaporizing surface is never wetted in the ordinary sense of the term, and vaporization goes forward at the highest rate possible in view of the nature of the liquid supplied to it. It is none the less progressive, as noted, though it is freed from artificial restraint.

With vaporization being carried to completion over the whole of the surface, in this way, localization of higher boiling components and their residual solid matter is completely avoided. Furthermore, while it is inconceivable that such solid matter is not formed in this method, it is a fact that whatever deposit is formed is being continually subjected to a sort of washing. This may account for the almost infinitesimally thin coating found on the interior walls of such a vaporizing chamber after nearly three years of continuous use. It was found to be impossible to scale off a sample for measurement, the coating being so thin as to resemble a chemically formed black finish.

#### Passage vs. Spot

To complete this comparison of the two methods, there remains the point of chief distinction between them. In the heated-passage method the vapor and the air used as the vehicle for the liquid fuel are constrained to pass through a highly heated portion of passage under certain much used conditions of operation of an engine. This is inherent in the method, inasmuch as varying lengths of passage are used in the actual evaporation under varying conditions of operation. Obviously the passage must be long enough to complete the process under those operating conditions demanding the greatest length—and thus under conditions where less length would be sufficient more or less superheating of the vapor and air results. Without going into the consequences, at this time, it must be said that this variation is wholly undesirable and is the one thing that is being most striven against in devices intended for the employment of the cheaper and heavier fuels.

With the carbureter and vaporizing chamber arrangement developed by the writer, and with special reference to which the above on direct vaporization method is written, the finely divided fuel is projected in minute globules into a chamber exteriorly heated by the exhaust gases. The arrangement is such that practically none of the air forming the mixture enters this chamber. The result is that the vapor issuing from the vaporizing chamber in a direction contrary to the paths of the ingoing fuel particles is never normally subjected to superheating. This follows from the fact that it at all times exists in the presence of its own liquid, and is thus always at the temperature of saturation, which in this case varies only with the pressure existing in the system. Following its issuance from the chamber in vapor form, the fuel mixes with the air of the mixture. This latter, being taken in at atmospheric temperature, is cooler than the vapor, causes it to condense into a smoke-like fog, giving up its latent heat to the air. Thus the temperature of the air is raised, giving to the resulting mixture a temperature higher than atmospheric by an amount determined by the relative masses of air and vapor and the heat of vaporization made latent in the vapor.

Since superheating of the vapor cannot occur, as noted, the only item that can cause variations in the temperature of the resulting mixture is, with any one fuel, that of variations in the proportions of the mixture. Furthermore, consistent with the state in which the fuel exists in the final mixture, the temperature of that mixture is the minimum possible. A great deal of checking of mixture proportion and mixture temperature against experimentally determined heats of vaporization, for a wide range of fuels, has shown that in every case the difference between the final mixture temperature and that of the atmosphere is exactly that which would result from the application of an amount of heat equal to the heat of vaporization of the fuel in question to the proportional amount of air used.

From both commercial and operative points of view, the inability to superheat the vapor in this method is of extreme value, in that no regulation of any sort need be imposed on the amount of heat made available to the exterior of the vaporizing chamber. All that is necessary in this direction is so to proportion the surface area of the vaporizer to the quantity of fuel and exhaust temperature that the result sought is attained under the least favorable conditions of operation. This being done, the temperature of the mixture is inflexible and is automatically fixed over the whole range of operation by that inherent characteristic of the fuel used, its heat of vaporization. On this point attention is drawn to the accompanying graph of exhaust and mixture temperatures as found in a four-cylinder engine operated on kerosene. The part throttle curves, while obtained on the dynamometer, are plotted through points read with the engine loaded and throttle set to deliver the amount of power required to drive the car from which the engine was taken at corresponding speeds on a level cement road. The powers required thus to drive the car were determined by a series of runs on the road with an accelerometer.

## Guiding the Workman's Personal Expenditures

(Continued from page 541)

on a solid, wholesome basis of living, whether he needs medical attention, also whether or not he is in debt. This investigation is made within 30 days after the man is hired, after which a recommendation is made to the proper inside department. If he is deeply in debt, an arrangement is made with his creditors whereby they will deal more leniently with the man in question and every effort will be made to have the matter straightened out at an early date.

The power of firing a man is taken entirely away from the foreman. He can, however, discharge him from his department, in which event the employee returns to the employment office, where he is assigned to some other department.

Another phase of the educational work pursued at the Ford plant is the Ford English school which was started in 1914. The first class of 115 members was graduated in 1915. In February, 1916, a class of 519 was graduated, and in October

of the same year a third class comprising 230 men was graduated.

Space does not permit going into detail regarding the many phases this work has. The work is devoted to the human side of life and every problem presents its own individual circumstances and must be solved independently. It is that kind of welfare work that is a man-to-man, character-building proposition.

It must not be assumed because it is successful with the Ford company that the same mode of operation should meet with success in other organizations. The success of the plan depends almost entirely on its correct application to the situation in hand. The same plan may not work to advantage in any other institution. The principle, however, is here and other manufacturers can well learn from what has been accomplished by this wonderfully large organization.

# Closed Body Construction

A Pronounced Tendency Toward Lighter Roofs—Three Types of Roof Models Now in Use—Striking New Brewster Design—New Ideas in Windshields and Other Fitments

By George J. Mercer

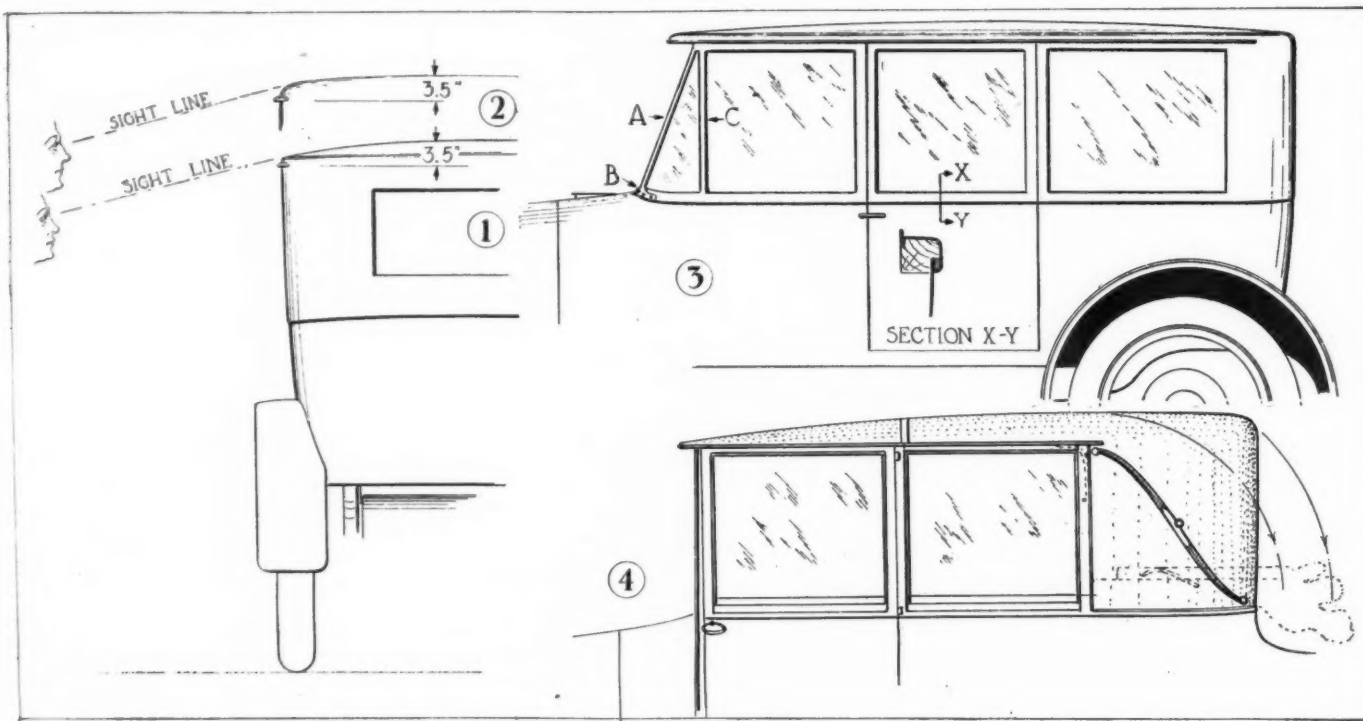
CLOSED bodies are all made adaptable for use during the changing seasons of the year, and all radical changes in construction in the past few years, or since the flush side body was adopted, have been along the lines of making the conversion features more pronounced. The most conspicuous innovation is embodied in what is called the convertible type, in which the sides are opened from front to rear and the roof remains stationary.

The aim of designers at present is to have the closed body as light looking as possible, and while at the two January shows only the Brewster inside drive body showed originality along these lines, there was a strong undercurrent that will make itself felt in no unmistakable manner once business is back to normal. Very few bodies were exhibited with thick-looking roofs, the majority having roofs of straight lines and medium light looking. Some were very light; there were a few that were heavy, as indicated in Fig. 2, and practically none with the extreme dip at the front and rear. Fig. 3 is a good example of average practice.

Fig. 1 shows how the light appearance is attained with the top. The height of the center above the drip moulding is the same in Figs. 1 and 2, but the thickness

of the edge is less in Fig. 1, and this is all that is visible to the eye, as indicated. The thin edge also decreases the framing and actually saves some weight.

The weight of a top like that shown in Fig. 3 is approximately 350 pounds, and this weight set on pillars has a momentum forward when the car is stopped suddenly, and produces a cracking strain at B. Therefore, a body with the front pillar at an angle as shown at A is better able to withstand the pressure than one with a perpendicular pillar, and manufacturers who produce in quantities make this pillar a casting and bolt through the body framing as shown at B, the flange and the bolt heads being visible at the top. A less conspicuous foot is fastened with screws to the top rail. The cast pillar is thinner than one made of wood. All the other pillars are of wood and are cut down in size all that the necessary allowance for runways for glass and the thickness for locks and hinges will permit. This is for the purpose of having the windows as large as possible and to obtain less obstruction to a clear outside view. Also pillar C is often eliminated, to improve the design. The only objection to this is that the glass window, being irregular in shape at the front, does not slide so well and is more troublesome to hold tight when down.



Figs. 1 and 2 show how the light appearance is attained. Fig. 3 is a good example of average practice. Fig. 4 illustrates a new falling top body



Roofs are of three different types of construction, the carriage roof, the leather covered and the metal. The first two were used on carriages and the last is a development of the automobile metal body.

The carriage roof is a laminated wood panel,  $\frac{3}{8}$  in. thick, glued over the framing and bows and covered with canvas glued to the panel and painted to make it waterproof. Its disadvantage is that the edges of the canvas tend to come loose from the joint formed by the body metal side panels. To make it serviceable these edges should be secured by mouldings. The leather roof is used largely on high-class work. Its edges are secured by narrow mouldings. The even contour of the roof sweep is obtained by placing a thin wire mesh, fastened to the framing, under the leather and between layers of cotton wadding. This is the lightest roof made, and this and the carriage roof are soundproof. The criticism of the leather roof is that mouldings are required for fastening the leather edges, and these show. The metal roof is of aluminum, in one sheet, welded to the top edges of the back and side body panels. When first used it caused trouble by generating a bell sound inside the body, but this has been overcome by packing well with a deadener of felt and cotton. The metal roof is heavier, but it is also stronger than the others, because the top sheet is continuous with the sides and back, to which it is united by welding, and the solid parts of the rear of the body serve to steady the roof. One other criticism is that the metal roof will not hold the paint as well as the carriage roof under the influence of the sun's rays. Altogether, however, the metal roof is the best manufacturing proposition; the extra weight can be overcome to a large extent by using a lighter wood frame, and there are no mouldings to show. The leather top will be used for special bodies, because leather looks rich, even if a few mouldings are required.

### Roof Lighting Methods

The Brewster body at the Astor Salon in New York was a study in methods of making a roof light. The covering was canvas stretched over thin framing and light bows, and the edges were fastened under the drip molding that was continued all around the top edge of the body. This roof was at least 250 pounds lighter than the average body of the same size, which shows what can be done in the way of cutting down weight. This roof will keep out the water as well as the heavier one, and, after all, that is what a roof is for.

The elimination of mouldings on the body is an important matter, the aim being to have the whole exterior unbroken. The section XY, Fig. 3, shows the overlap panel by which this is obtained at the belt. This is the place where the upper and lower panels are joined. The illustration shows the upper panel wrapped around a steel band, and when this band is fastened by machine screws the panels are secured in a manner that will never give trouble. Mouldings are also left off doors to a large extent, and, as shown in this same figure, the lower corners are made square, because the panel is also held by a steel band, and the square corner is better for this, because the fitting is easier and the liability of having an irregular opening around the door is less with the square corner than with the round or concave shape.

The convertible, in which the pillars are removed from front to rear, leaving the side entirely open and the roof stationary, is still the most popular of the all-year cars. In most designs the glasses all drop flush, except the rear quarter, which is taken out and put in a pocket at the rear of the back seat, and on the doors flappers are used. The Cadillac design has a much larger glass space than usual, this being made possible by having the glass be-

tween the doors and the quarter glass take up part of the pillar thickness, making the latter narrow. These glasses, of course, are too wide to drop and have to be lifted out, but the disadvantage of the extra glass to lift out is compensated for by the increased light space thus provided when the glasses and pillars are in position.

In connection with the front windshield on inside drive bodies, the problem of keeping out the rain has practically been settled by making the lower part of the glass stationary and using a removable rubber channel on the top edge when it rains, the upper part being hinged to swing outward only and coming from  $\frac{3}{4}$  to  $1\frac{1}{2}$  in. below the top of the lower part. The sides are protected by rubber in the frame and at the top hinge. The roof projects forward, as in Fig. 3, and, in addition, there is either a metal skirt or moulding nearly covering the joint, or else rubber packing. There were fewer storm visors or double upper glasses, and ventilation at the bottom was by a ventilator in the top of the cowl.

### New Falling Top Body

Fig. 4 illustrates a falling top body that is new here and may be described roughly as a combination of the coupelet and the English cabriolet. It is a close coupled four passenger body, and the roof above the door forward is stationary. It is easy to operate and not expensive to build, as no fixtures but those in regular use are required. Folding top bodies showed a slight increase over previous years, but they were nearly all of the cabriolet design. The standard town car cabriolet was exhibited among the stock cars at the Grand Central Palace in New York. The limousine landaulet, so popular a few years ago, has only a few representatives. In connection with the folding top, it is the custom to use the spring at the rear of the back pillar to assist in raising and lowering.

Other general construction features are the almost total absence of cowl lamps. Pillar lamps are confined to the ultra carriage type town car body. Packard uses the flush pillar light. Window regulators are used on the doors and division, but straps are the most common on the rear quarter windows. Extra seats when facing forward are of the floor type and the majority are concealed when not in use, the vertical position when concealed being the most numerous.

The slanting windshield is the most used, and there is a general tendency toward the close-coupled body with the divided front seat, the doors in the middle on both sides, and round corners at rear, the square corner rear being confined to the carriage town car, which generally has the six fenders and steps in place of the runboard.

### Cork Insert Brake Lining

HAVING heretofore confined itself to the manufacture of brake linings for replacement on Ford cars, the Advance Automobile Accessories Corp., Chicago, Ill., will hereafter also supply these linings for others cars. Cork insert brake lining is made of high grade fabric, into which are inserted disks of cork. The reasons for the use of cork are that it has an exceptionally high friction co-efficient and that this co-efficient is very little affected by the presence of oil on the brake surfaces. Owing to the high friction co-efficient, comparatively little pressure is required on the brake pedal. The lining is impervious to oil and grease, consequently it will not swell and the surface never becomes glazed or slippery.

We are informed that these brake linings have been used by a Chicago taxicab company for over 6 months. It is obvious that the service on a taxicab is very severe, but in spite of this fact, the cork insert lining is said to have given most satisfactory service, the brakes being still as efficient as when installed and show practically no wear.

# True Importance of Combustion Chamber Shape Not Known

Opinions Vary as to Its Effect on Economy, Particularly as Regards Ratio of Wall Area to Volume

By J. Edward Schipper

**C**OMBUSTION chamber shape is a matter to which little or no importance is assigned by some engineers, whereas others make it one of the fundamentals of design. With the growing importance of economy, it is important to know definitely whether or not it makes any material difference. Manufacturers of certain types of overhead-valve and overhead-camshaft engines are claiming performances of between 25 to 30 miles to the gallon of gasoline, while others are quite candidly admitting that 12 to 15 miles per gallon is the best that can be secured during the colder months, with only slightly better performance than this during the warm months.

If one type of engine is twice as economical as the other in fuel we should analyze the subject and learn what a factor combustion chamber shape is in this.

The ideal combustion chamber shape, from the theoretical standpoint, is a hemisphere with the base formed

by the piston head. Engineers differ as to how important the attainment of this ideal is. It is a practically impossible commercial proposition to attain the spherical shape, but there are makers who endeavor to approach this, and it is important to note whether those who do approach this spherical combustion chamber closest are obtaining, or at least claiming, the highest fuel economy.

## Big Valves Cause Difficulty

One of the biggest difficulties to overcome in combustion chamber shape is that engineering practice leans toward small bores and large diameter valves. This is true because the valve lift must be taken care of, together with the inertia of the valve gear itself, when the engine is running at very high speeds. This causes the combustion chamber to be higher above the valves than any other place. With these conditions holding true, the shape of the combustion chamber is really controlled in most instances by the exigencies of design, with care taken that both intake and exhaust have a clean sweep so that the gases can flow freely into and out of the cylinder. This creates a condition which is difficult because the smaller the valves the easier it is to secure a good combustion chamber shape, whereas, on the other hand, if the valves are too small there is a reduction in volumetric efficiency, and hence the output for any given cylinder displacement. It seems to be the general consensus of engineering opinion that the shaping of the combustion chamber so that the intake gases act as a cooling agent on the exhaust gases is an erroneous method; in fact, it

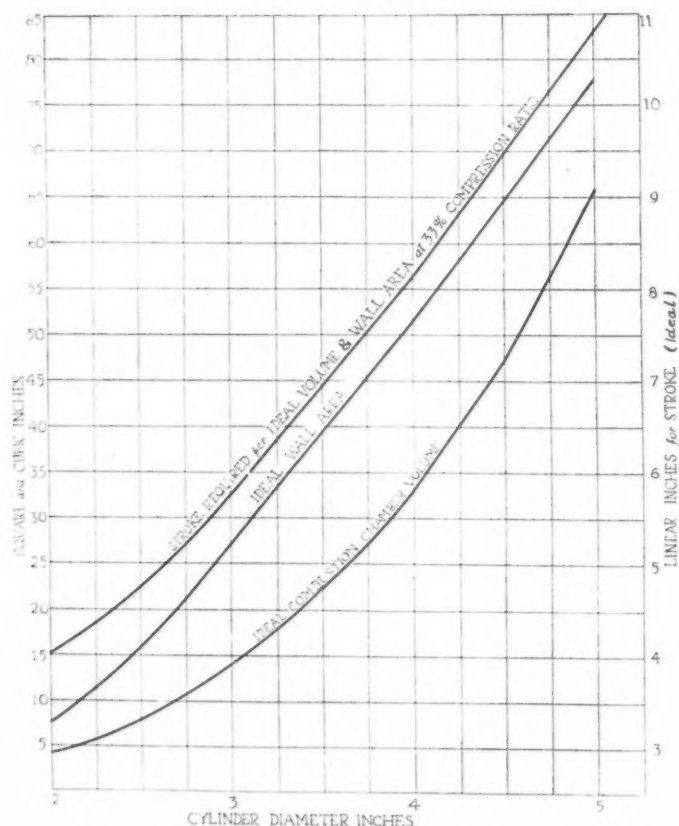


Fig. 1—Curves showing combustion chamber ideal volume (were it possible to secure a perfect hemisphere) for bore diameters from 2 to 5 in. Curves also indicate ideal wall area for hemispherical combustion chamber shapes and the stroke required for ideal volume and wall area at a 33 per cent compression ratio

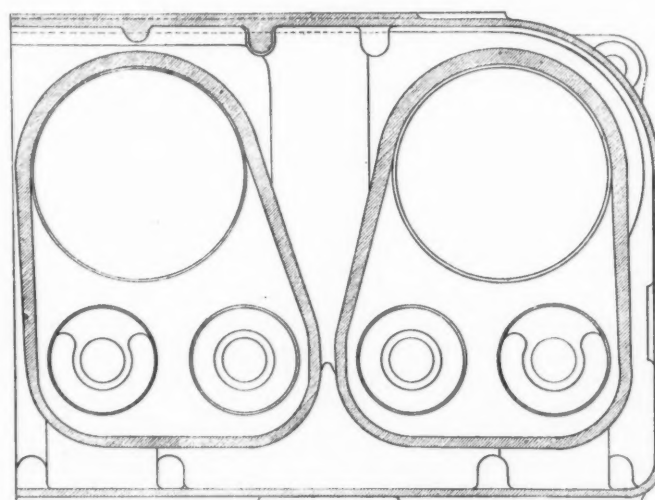


Fig. 2—Horizontal transverse section through combustion chamber of L-head engine, illustrating wide departure from theoretical shape, which would be a hemisphere, and indicating large ratio of superficial wall area to volume



is generally believed that the intake gases have very little to do with the cooling of exhaust valves, either on the L, T, or valve-in-head engine. What is of considerable importance is that the superficial wall area does not attain too great a total in comparison with the volume of the combustion chamber.

### Lose 30 Per Cent by Cooling

The heat passing from the combustion chamber into the cooling jacket is in direct proportion to the area of interior cylinder wall exposed to combustion temperature. When it is remembered that approximately 30 per cent of the heat of the fuel is dissipated through the cooling water, it is quite important that a careful study be made of the possibilities of reducing this percentage. Since economy has become one of the cardinal virtues of engine design this becomes a matter of prime importance.

Gasoline engines are non-economical when they waste heat; in other words, when all of the heat which could be transformed into useful energy is not taken advantage of because of the thermal inefficiency of the plant. The problem of reducing the amount of heat thrown away through the waterjacket is largely one of combustion chamber shape, and combustion chamber shape is largely a matter of valve location.

A thoroughly impartial study of the subject, both in

the laboratory and on the road, would more clearly bring to light the underlying principles of combustion chamber which most closely bear upon this point. The crucial question is: "Can we start with a desirable combustion chamber shape and make the valve layout coincide with this, with the minor modifications necessary for manufacturing reasons; or must we start in the other direction and let the combustion chamber shape follow as it will?" In the true determination of the real effects of combustion chamber shape on performance lies the answer to the question.

As a matter of theoretical interest, there is only a limited range where the volume inclosed by a hemispherical combustion chamber would give practical results. This is true because the stroke required to give a normal compression ratio would either be too small or too large beyond a certain range. This range is indicated graphically in the curve herewith. With a 33-per cent compression ratio, that is, where the compression chamber volume is one-third that of the piston displacement, the stroke required within the range of bore diameters between 2 and 5 in. has a ratio to the bore of about 2 to 1. Beyond bores of 3 in. this is impractical for high-speed work, and in fact is not desirable practice throughout the entire range, as a ratio of 1.5 to 1 is much closer to what has been found desirable.

## Smith Form-A-Truck Army Kitchen

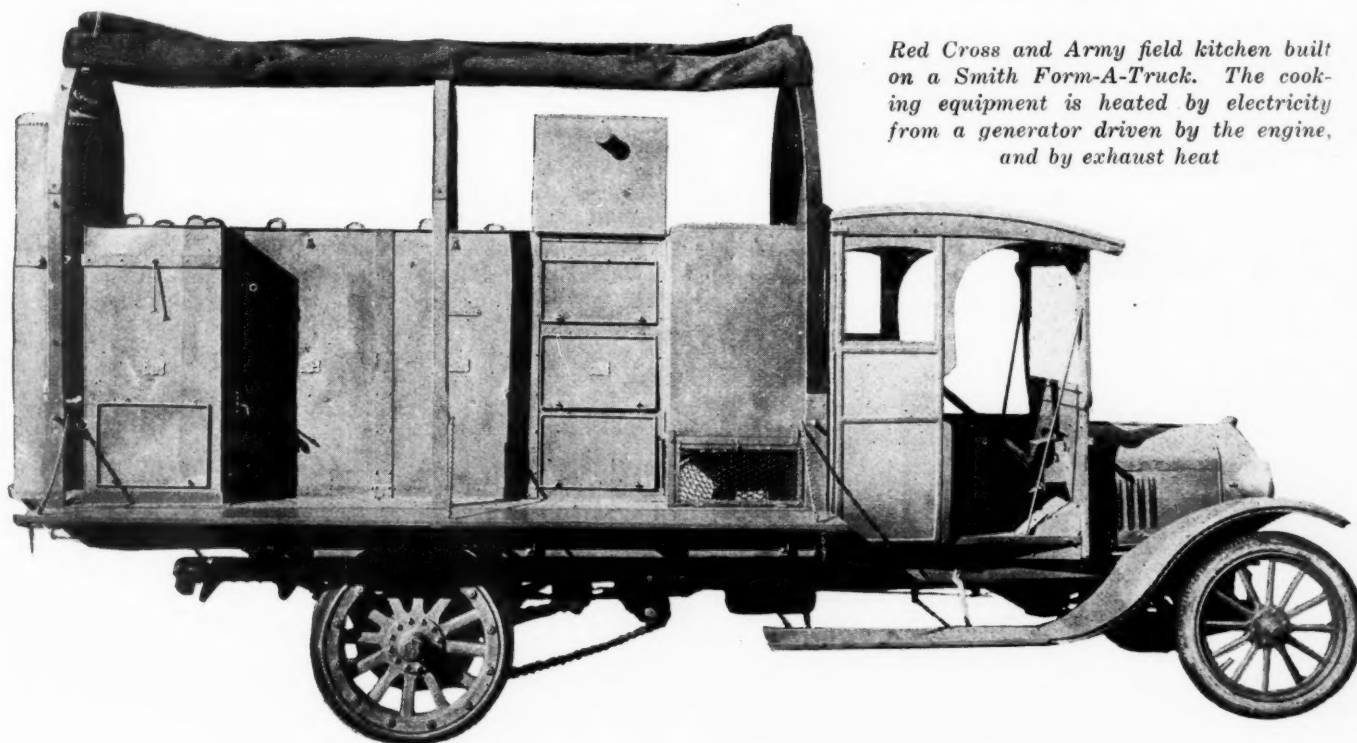
ONE of the uses to which motor trucks are put in war time is as portable army kitchens. The cut herewith illustrates such a kitchen built on a Smith Form-A-Truck. It has been worked out to meet every requirement of Red Cross and army field service. Heat for cooking is obtained from an electric heater receiving current from an electric generator driven by the truck engine, and this heater is assisted by heat derived from the exhaust of the engine.

The portable army kitchen is equipped with two 30-gal. fireless cookers, with a 26-hr. cooking heat efficiency, a 30-gal. coffee urn, a 30-gal. vegetable and soup urn, exceptionally

well-constructed baking and warming ovens and two large hot-water sterilizing tanks which will sterilize 120 gal. of water in two hours.

In addition to supplying current for the cooking equipment the electric generator has sufficient capacity for operating a 13-in. electric searchlight and 600 electric incandescent lamps working at 110 volts. The searchlight will throw a beam of light for a distance of 3 miles.

The generator being direct connected to the automobile motor, this Red Cross and army kitchen can be operated either while traveling or while standing still.



*Red Cross and Army field kitchen built on a Smith Form-A-Truck. The cooking equipment is heated by electricity from a generator driven by the engine, and by exhaust heat*

# First Standardized Repair Depot For Quartermaster Mechanical Transport

Model for Others Here and in France Will House 2000  
Soldiers and 100 Officers—Four Truck Trains Arrive Daily

By Allen Sinsheimer

**B**ALTIMORE, March 9.—The first standardized repair depots for the Quartermaster Mechanical Transport Units at this city and Atlanta, Ga., are well under way. Barracks have been constructed to the number of thirty-two, with a capacity for housing 2000 men at each depot. Ground has been broken for the construction of storage houses, crating shops, and the repairshops. The depots will do truck and passenger-car repair work, assembly work, crating for oversea shipment, and will store parts and complete vehicles and will act as commissaries for automotive supplies for their respective districts.

The depot here will supply eight cantonments and the entire district from Roanoke, Va., to Camp Nevins, Mass., including cantonments as far west as Camp Custer, Mich., and Camp Sherman, Ohio.

This repair depot is built just as the others in this country and in France will be built, with standardization of buildings, shops, tool rooms, etc., so that a mechanic taken from Baltimore and placed at Atlanta, Ga., or at a depot in France, will know immediately where to look for his tools, his barracks, the officers, storage buildings, etc.

## Capacity to Be Enlarged

The Baltimore depot, when complete, will have a capacity for 2000 soldiers and 100 officers, although at this time tentative plans are under consideration for an increase in additional building construction and acreage to provide for 3500 soldiers. The main repair shops here will employ 1163 men.

The barracks have been erected in rows of four, with each row sufficient for a company, and a separate mess hall and lavatory for each row, thus providing separate facilities for each company. The repairshops will probably be completed within 90 days.

Equipment has been ordered to be delivered on schedule, and will be ready for installation as soon as the buildings are finished. The site occupies 90 acres, but Col. Leisering, who is in charge of the depot, hopes to secure the purchase of a near-by distillery plant which has an additional 20 acres, and which he intends to convert into storage space.

## More Than 60 Buildings

The building plans include four officers' quarters, thirty-two barracks, each 32 x 60 ft., eight mess halls, eight lavatories, one administration building, one post exchange, one medical building, one oven bake room, several minor buildings, one mechanical repairshop, 480 x 497 ft., one storage plant 720 x 136 ft., and another storage plant 554 x 140 ft.

Trucks are being shipped daily to the depot. An average of four trains per day of trucks, with each train carrying thirty trucks, are being received, two of the trains coming daily from Detroit and two from Rochester, N. Y. The Detroit trains, in addition to carrying the

trucks, bring with each thirty trucks one roadster, one touring car, one tank car, and one light repair car. Each truck shipped is loaded with 2 to 3 tons of extra parts. There are at present about 700 trucks on hand. It is expected that, making allowance for the requisitions coming in daily for trucks, there will probably be 1200 on hand early next week.

## Strategic Location Chosen

The location of the depot at Baltimore is particularly good. It is so situated that it is accessible directly by water and by the Baltimore & Ohio Railroad, which is building five switches through the grounds. It is within a few miles of the freight depots of the Western Maryland and Penn railroads. The trucks can be delivered overland. It is located on the Philadelphia highway, between Baltimore and Philadelphia, easily reached from the Lincoln highway, and therefore convenient for overland driveaways.

Every attention is being given to the comfort and health of the soldiers who will be stationed at these depots. A near-by river will supply fishing and swimming facilities. An extra plot of land has been set aside for a recreation hall, Y. M. C. A. branch, and Knights of Columbus building. Drinking water will be secured from artesian wells. Separate plots of ground have been set aside to be converted into small parks and baseball grounds.

Colonel Leisering has suggested that a truck company be established at this camp also for the purpose of making truck driveaways from the depot to the points of embarkation.

## All Repair Work Standardized

The plan of repair work was outlined in these columns several weeks ago. It comprises a method which includes a shop manual arranged under the direction of George Randles of the Motor Transport Section of the Quartermaster Corps. The shop manual so strictly defines the necessary repairs and procedure that it practically eliminates all opportunity for careless repair work.

For example, the arrangement of all buildings will be the same, having all parts, tools, etc., in the same place in each. This will facilitate the transfer of workmen. The shop manual has been prepared after intensive study of the best methods of making every adjustment and repair that will ever be necessary.

Workmen are not permitted to deviate from the instructions laid down in the manual. Thus, if a cylinder appears in need of regrinding, not even the foreman has authority to say whether it shall be done or not. The repair manual exactly defines when the work is necessary and tells how to do the job.

All tools are standardized, even those in individual kits, and such machines as lathes, shapers, drills, grinders, etc., also are of identical pattern.



## Views of the First Standardized Truck Repair Depot



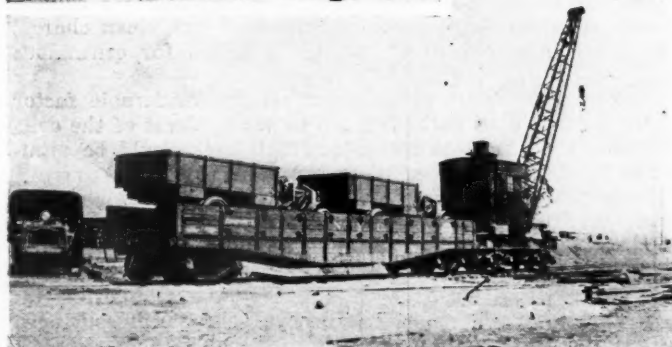
*These two views show part of the barracks which have been erected at the Baltimore standardized repair depot for the Quartermaster Mechanical Transport Unit. They will house 2000 soldiers and 100 officers*



*Seas of mud make necessary the laying of wooden tracks like those shown below in order that the trucks may be moved*



*Here is a small part of the stock of trucks which have been received at the depot. At present more than 600 are ready for storage or shipment overseas or to other points*



*Two trucks are loaded into each gondola car. For unloading there is a mammoth steam crane which picks the trucks up bodily and deposits them at one side*

*This shows how the trucks arrive in trains passing over a temporary road-bed into the depot. At present four such trains arrive daily*





# The FORUM



## Balancing on Parallels

By N. W. Akimoff, Philadelphia

ONE of the fundamental rules in the author's laboratory of balance is never to let a balanced article leave the place until a record has been made of the so-called *sluggishness* or lack of sensitiveness of the balancing ways or parallels. This is done in the following manner:

As soon as perfect static balance has been secured on the balancing machine, in rotation, the article is placed on the ways and a slight static unbalance purposely introduced, to the extent of being felt by the ways. Several positions are being tried and the average entered on records as *sluggishness* or *residual unbalance*.

While the rotary balancing machine leaves absolutely no room for any *personal equation*, as to whether static balance is fair, good or bad, the parallels necessarily must depend on the operator's temperament and other influences, entirely foreign to the problem itself of finding balance.

Such personal element accounts in marked degree for some of the apparent inconsistencies in the submitted table, which nevertheless establishes the fact that very considerable static unbalance can remain in a body, even if carefully balanced on the parallels; this fact is not at all a reflection on the ways, but only tends to establish the limits of their usefulness; those interested in this subject will find some data in the paper recently read by the writer before the A. S. M. E. (December, 1917).

Nature of article	Weight, lbs.	Bearings	Residual static unbalance or sluggishness, in inch-ounces
Crankshaft .....	68	2 3/8"	1.18
" .....	100	2 7/16"	1.25
" .....	88	2 1/8"	.92
Pulley .....	112	1 7/8"	1.48
Flywheel .....	126	1 7/8"	1.02
" .....	114	1 7/8"	1.97
Crankshaft .....	63	2 1/2"	1.83
" .....	70	2 1/8"	1.56
" .....	91	2 5/8"	1.64
" .....	30	1 1/4"	1.95
" .....	110	2 1/2"	.93
" .....	94	2 1/2"	2.12
" .....	86	2 1/4"	1.48

Most of the shafts are not over 0.002 in. out; if more, the usefulness of the ways is decreased further.

The permissible amount of residual unbalance of this kind, recommended by the writer is, 4 in.-oz. There is a double reason for bringing down sluggishness: First, static balance as such; and then its importance for securing dynamic balance, the very foundation of which is perfect static balance.

## Advantages of Scavenging

By J. B. B.

SCAVENGING is a subject of considerable interest as well as of importance in these times of high-priced gasoline. The latter is frequently of an inferior grade, and the power developed with it is low enough without the fuel charge being diluted with from 25 to 30 per cent of the burnt gases.

Let us take a view of the interior of the combustion chamber when the motor is in action. We see the furnace condition, except when one gives the motor a few whirls with the starter sans spark, and then what a satisfactory decisive pull for a moment or two, until the burnt gas again asserts its influence.

When Otto conceived the idea of an intermediate stroke without firing, his purpose was to reduce the volume of these residual gases, and it was Otto who made the present form of motor good enough to get by with.

But the clearance volume is still full of these detrimental gases and, viewing the interior of the combustion chamber again, we note the new charge coming in and being split up into globules, streaks and eddies with the consequent slow propagation of flame and power. The combustion is also hindered, and none of us know the percentage that goes out through the exhaust without having performed any useful work.

Viewing the interior again, we note how the motor rebels at low speeds, when we are compelled to slow down, and the throttle is admitting just enough fuel to keep in action. Imagine the added flexibility if this small charge came in undiluted by the burnt gases. Also imagine how much less fuel would be required to perform the same service, and do the work better in every way.

Drive out this volume of burnt gas completely, which approximates 800 to 900 degrees Fahr., replace with a fresh pure gas at 70 to 80 degrees Fahr. and the heating of the motor will be diminished in a large degree and with a corresponding saving of lubricant, as it is unquestionably these burnt gases that burn the oil from the cylinder walls. The tendency of the scavenging motor to overheat will be considerably lessened even though the explosion temperature is higher.

The unadulterated gas not only adds power by reason of a greater charge entering the cylinders, but the purer, quicker-burning mixture will give a better torque at low speeds and at the same time speed up the motor and keep down the gas velocity, so that we get a range of flexibility and acceleration in a four-cylinder motor approaching a six of the conventional non-scavenging type.

In expelling all the burnt gases, and substituting a complete pure mixture, the compression temperature is lowered and a corresponding increase in compression would be quite safe as far as pre-ignition is concerned. Together with the spontaneous combustion, a steeper expansion curve in the pressure diagram results. Thus lower terminal pressures and temperatures are reached when the exhaust opens; in other words, the gas is used more expansively.

The unadulterated charge will result in a straight power curve up to very high speeds. This feature alone is a factor of inestimable value in aviation.

With an unadulterated charge, the piston displacement can be reduced by the volume of the original combustion space and then more power generated than previously.

The high temperature in the non-scavenging motor subjects the valves and all parts to undue strain, tends to warp them, and to cause scoring and seizing. Remove the evil influence of these burnt gases, substitute a cool, clean charge, and what improved conditions are obtained for continuous and satisfactory operation.

Furthermore, these burnt gases are a considerable factor in the formation of carbon, which is not the least of the evils occasioned by their presence, and this evil would be minimized by the expulsion of the burnt gases.

Development work on the internal combustion engine has made great strides, and engineers have accomplished wonders, not only in the structure itself, but in carburetion and ignition, but, singularly enough, they have lugged along these burnt gases until they have become a veritable Sinbad.

When scavenging comes into general use, the present non-scavenging motor will be regarded in the light of the original two-cycle motor, except that it is a step forward.

The demand and the necessity for a better and safer aviation motor, however, make scavenging imperative, and this improvement must, and will surely be the next stride forward in the march of internal combustion engine progress.

That the remnant gases cause a loss in efficiency is proved by the superior average performance of large stationary scavenging engines, in which these residues are largely driven



out. The need now is for a mechanism to accomplish this much-to-be-desired purpose, that is simple, and will consume as little or even less power to operate than the present non-scavenging type.

We have not worked in this direction sufficiently. The demand for motors for automobiles has grown so quickly that the motor people have fitted themselves with patterns, forms, templets, jigs and tools for types that have been so much better than the original form that they have been reluctant to go into research work. But thanks to aviation, the time has now arrived when improvement must come, and it must be first on the lines of scavenging the burnt gases.

## Van Briggie Carbureter Has Three Adjustments

ONLY well tried principles are embodied in the Van Briggie carbureter manufactured by the Van Briggie Motor Device Co., 429 North Capital Avenue, Indianapolis, Ind. The device is of the type in which the float chamber is concentric with the mixing chamber. A needle valve is located in the mouth of the spray nozzle and the latter is surrounded by a Venturi tube. The needle valve in the spray nozzle can be adjusted as to height, and is raised more or less according to the position of the throttle valve, which acts upon it through the intermediary of an adjustable cam.

The outstanding feature of the Van Briggie is the thorough provisions made for insuring a rich mixture for starting. Not only are both the air inlets choked off, but the needle valve is lifted out of the spray nozzle so as to render the flow of gasoline as free as possible.

The same as the majority of modern carbureters, the Van Briggie has two air inlets, a primary and a secondary. Both are located on the same side of the carbureter, the primary below and the secondary above. In the primary air inlet there is a choke valve which connects to a three arm lever supported on the carbureter, from which connection can be made to a choking device which is preferably located on the steering post. Air entering the primary air inlet passes down a passage outside the Venturi tube and then up this tube, at the narrowest part of which it has the fuel mixed with it. At its upper end the Venturi tube debouches into a horizontal passage, at one end of which is located the supplementary air valve and at the other the throttle valve. The supplementary valve is of the poppet type and is provided with a dash pot to prevent fluttering. Adjustment of the supplementary air

valve can be made by means of a thumb screw on top of the carbureter in a most accessible position, and when the adjustment has been made it can be locked by means of a machine screw. To increase the amount of supplementary air the adjusting nut is turned to the right, while to lessen it, the nut is turned to the left. Pivoted to the hub of the throttle lever is a cam which acts on a lever arm connecting to the gasoline needle valve. The cam can be adjusted by means of a set screw in a lug on the throttle lever hub, and this forms the high speed adjustment. To obtain more gasoline at high speed, the set screw is turned to the right, while to impoverish the mixture at high speed, the screw is turned to the left.

Adjustment for low speed is made by means of a nut at the upper end of the needle valve. To reduce the amount of gasoline at low speed, this nut is turned to the right, while to increase the gasoline, the nut is turned to the left.

As may be seen from the sectional view, the float is of the cork type and acts on a needle valve located in a pocket at the side of the float chamber.

The choking valve, of course, is provided to facilitate starting in cold weather. By means of this device not only can the primary air inlet be entirely shut off, but at the same time the supplementary air valve is held against opening and the needle valve is lifted out of the spray nozzle, so that even though the cranking speed may be low the engine will receive an amount of fuel adequate for starting. When the engine is to be started the choke lever or rod must be pulled up and held tight. After the engine has turned over a few times and picked up its cycle, the choke is released a little, and as the engine warms up, it is completely released. The choke must not be held open too long, as this would result in flooding the carbureter.

The supplementary air valve, of course, is adjusted properly at the factory and the adjustment should not be disturbed unless the engine develops a tendency to "spitting" or backfiring through the carbureter, in which case it is well to adjust the air valve to admit less air.

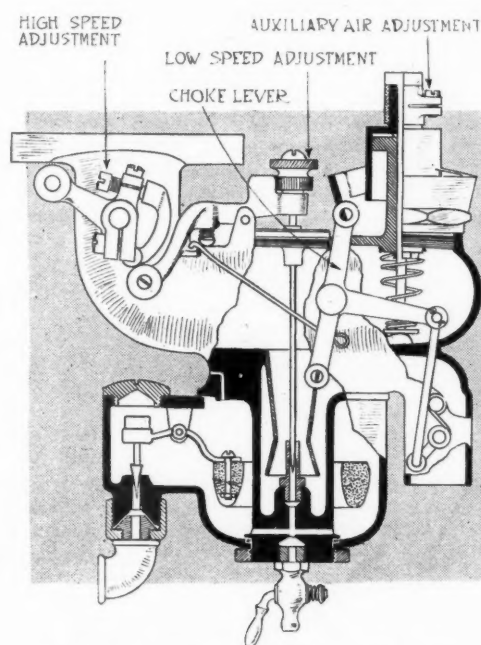
## Book Review

AVIATION Engines, Their Design, Construction, Operation, and Repair. By Lieut. Victor W. Pagé, Aviation Section, F. C. U. F. R.; 576 pages and 253 illustrations. Published by the Norman W. Henley Publishing Co., New York. Price, \$3.

Owing to the fact that thousands of young men are now being trained in operating and caring for airplanes and airplane engines, there has arisen a demand for a book explaining in simple language the construction and care of such engines. Mr. Pagé, in the book under review, has attempted to meet this demand. The subject-matter is covered in 12 chapters, of which the first two deal with the different classes of aircraft engines and the principles underlying their construction. Separate chapters are devoted to the fuel system, ignition and the lubricating systems. The remaining chapters deal with the practical operation of the engines and their installation on aircraft, while in the final chapter are given brief illustrated descriptions of a considerable number of prominent aircraft engines, both of the stationary and the rotary type. The book should prove useful to flying pupils, aircraft mechanics and others interested in aviation from a practical standpoint.

ACCORDING to the *Autocar*, an engine which is inclined to knock on the slightest provocation, can be cured by the use of a fuel composed of a mixture of gasoline and benzol. This is due to the fact that benzol has a higher temperature of ignition than gasoline, and mixing the benzol with the gasoline raises the ignition temperature of the latter.

IN a paper on "Friction Clutches," read recently before the Coventry branch of the Institution of Automobile Engineers, Herbert L. Towns gave the following figures for coefficients of friction based on his own laboratory tests: Bronze on bronze, .20; bronze on cast iron, .21; cast iron on cast iron, .15; leather on cast iron, .20; friction fabric on cast iron, .33; cork on cast iron, .30.



Sectional view of Briggie carbureter

# Traction on Bad Roads or Land\*

## Second Installment

### Four-Wheel Drive, Four-Wheel Steering and Four-Wheel Independent Drive Tractors—Classification of Track-Layer Type Tractors

By L. A. Legros

THE Superquad of the Walter Motor Truck Company, of New York, is an example of four-wheel drive and four-wheel steering. Each axle is fitted with an automatic locking differential of the Walter type, which remains automatically locked for normal running, but becomes unlocked when necessary, for example, in turning the car. The third differential gear on the main shaft, necessary in the case of ordinary differentials, is not required with this device, as either or both wheels on the axle which tends to overrun the other will become unlocked automatically, and will lock again as soon as the distribution of velocity becomes normal.

The vehicle is fitted with a pedal-operated transmission brake and a hand-lever operated back-wheel brake, both of which, owing to the fact that the main differential is either in gear or is locked, also act on all four wheels.

The Jeffery quad is a four-wheel driving and four-wheel steering vehicle. This vehicle is fitted with the M. and S. locking differential on each axle.

#### Four-wheel Independent Drive with Four-wheel Steering

The Couple-gear electric truck, and also the electric truck, on the same plate, of the Couple-gear Freight Wheel Company, of Grand Rapids, Mich., afford examples of four-wheel independent drive with four-wheel steering.

The wheel is of peculiar construction, having two large-diameter bevel wheels inclosing the motor which is placed out of square with the axle to a sufficient extent to allow both ends of the motor shaft to carry a driving bevel pinion. One of these pinions gears with the outer half of the wheel and the other with the inner half, so that the load on the motor shaft is balanced, a result further insured by the introduction of an "evener" or compensating gear. A channel frame carrying twin solid rubber tires is secured over the two bevel-carrying disks forming the wheel. The gear reduction from motor to wheel is 25 to 1. The motor is carried on a short hollow stub-axle keyed to a taper seat in the steering knuckle and secured by a nut; the wires are led to the motor through the stub-axle pin. The wheels run on roller bearings and are fitted with hand holes with removable doors to give access to the motors. There is one brake of the contracting type to each wheel, and also an electric emergency brake.

To enable the vehicle to be driven over roads which present uneven surface or very unequal resistance to traction a special form of control is arranged. Current is supplied to the motors of the four wheels through a controller of the street-car type modified to suit the conditions. This controller has five contact points, two of which (the third and fifth in the battery car, and the fourth and fifth in the gasoline-electric car) are arranged for what the makers term "parallel speeds," the motors being put in parallel when these contacts are made; thus, if one wheel slips it has no effect on the other three, or if two wheels slip there is no effect on the other two. The other three contacts are for what the makers term "building-up speeds"; on these points a sort of differential action is provided between the two groups of wheels taken diagonally on the car. The right front wheel and left back wheel form one group, and the left front and right back form the other group. When running on the third building-up speed a differential action occurs between the wheels of these

groups, so that if one wheel of the group slips, its fellow will be left without power. If under these circumstances the slipping continues, and the driver of the vehicle moves the controller forward to the next contact, all the wheels are then put to work independently of each other.

It is stated that on a dry gravel road a tractive effort equal to 60 per cent of the total weight of the vehicle can be obtained before the wheels begin to slip. This figure depends, of course, on the character of the road surface.

The accumulator-driven type of tractor is only recommended in cases where charging facilities are obtainable and the total daily mileage does not exceed 40 miles. These vehicles are not only used as ordinary lorries, but in many instances are adapted with a pivotal carriage to take the front end of a trailer which may be a goods wagon, fire-escape, or electric-tramway tower wagon. In this application the vehicle is sometimes known as a semi-tractor. The Couple-gear driving system is also applied to two-wheel drive vehicles such as fire engines. Fire escapes are dealt with by two methods, either as a very long wheelbase vehicle or on the semi-tractor principle with a long trailing wagon.

#### Applications of Four-wheel Drive to Bad Roads or Land

In the mining and agricultural districts of North America vehicles are required to negotiate long stretches of sand or mud. They are required to work on desert land, through sagebrush and among sand dunes, and they may even be used to haul trains of tip-wagons on a light railway straddled by the tractor.

The limitations in all these cases are defined by the engine power, transmission efficiency, insistent load, wheel diameter, tire width, weight of vehicle, and, when a trailer is hauled, the drawbar pull. There is no satisfactory method at present known for estimating the resistance presented by land, sand or mud, so soft that the wheels can sink to a depth of several inches, though it is known that the resistance under such conditions may be as much as 15 per cent to 20 per cent of the load.

Comparative figures for the different types of vehicle, their horsepower, speeds, load, weight, wheelbase, track width, turning radius, and overall dimensions are given in the table.

#### Conclusions

For the transport of goods over bad roads on gradients, varying from 1 in 15 on roads in which the tires sink 2 in. to 3 in. in depth to 1 in 5 on hard roads with bad surface, and for speeds varying from 1.5 m.p.h. on grades to 12 m.p.h. on fairly level roads, the four-wheel drive tractor has great advantages over the ordinary two-wheel drive tractor.

In the author's opinion it may be expected to rank as an important factor in the development of districts overseas not far removed from railhead, but having only primitive roads.

#### Chain-Track Tractors

The invention of the endless track or self-laying railway dates to nearly a century and a half ago. The first mention of a scheme analogous to that now adopted in so many forms of tractors is the British invention of Richard Lovell Edgeworth (Feb. 15, 1770) for a "portable railway" or artificial road to move along with any carriage to which it is applied. Although no drawings can be traced of the invention, the

\*Paper read before the Institution of Mechanical Engineers, on Friday, Jan. 18, 1918.



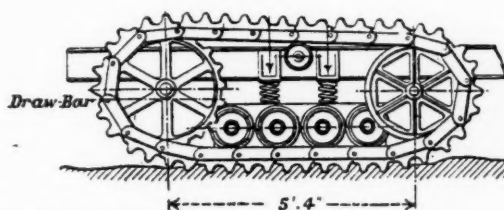
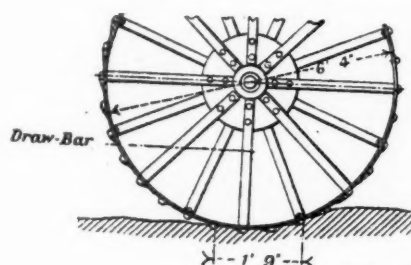
Table I

FOUR-WHEEL DRIVEN VEHICLES					FOUR-WHEEL DRIVEN VEHICLES							
Make and Description	Normal Load	Weight of Truck	Total Weight	Front and Back Wheels	Track	Wheel-base	Turning Radius	Width Overall	Length Overall	Platform Length	Chassis Width Outside	Clutch
1 FWD 1½-ton Model G.....	3,000			Diam.-Width	In.	In.	Ft.	In.	Ft.-In.	Ft.-In.	In.	Multiple disc Multiple disc Multiple disc Disc
2 FWD 3-ton Model B, 1915.....	6,000	6,000	12,000	36 4	56	124	46	70	16 8	11 4	36	
3 FWD 5-6 ton.....	11,000	10,000	21,000	36 6	56	124	46	88	16 8	11 4	36	
4 Jeffery Quad Model 4016.....	4,000	5,000	9,000	38 6 dual	72	148	34.5	74	21 8	13 0	38	
5 Walter Super-quad 3-ton Model.....	6,000	6,000	12,000	36 5	56	124	24	82	16 10½	10 0	38	Leather cone Leather cone Expansion cone
6 Walter Super-quad 5-ton Model.....	10,000	6,000	16,000	40 6	64	132	15	82	18 6	11 6	38	
7 Walter Super-quad Tractor.....	6,000	6,000	12,000	40 7	64	156	17.5	82	20 6	15 0	38	
8 Couple-Gear 3½-ton Petrol-Electric HC.....	7,000	9,000	16,000	40 4 dual	64	108	12.5	79	16 6	9 0	38	Electric
9 Couple-Gear 5-ton Petrol-Electric AC.....	10,000	11,000	21,000	36 3½ dual	66	144	13.5	82	18 6	14 0	..	
10 Couple-Gear Electric 5-ton Model A.....	10,000	11,000	21,000	36 4 dual	66	144	13.5	89	18 6	14 0	..	
11 Couple-Gear Electric 3½-ton Model H.....	7,000	9,000	16,000	36 4 dual	72	106	10	89	14 6	14 6	49	Electric
				36 3½ dual	66	106	10	80½	14 6	14 6	43	Electric

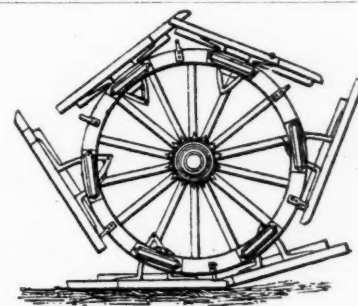
Approximate and estimated figures are shown in italics.

ENGINE						SPEEDS, BRAKES, ETC.							
Make and Description	H.P.	No. of Cylinders	Bore	Stroke	1st Speed	2nd Speed	3rd Speed	4th Speed	Reverse Speed	Foot-Brakes. No. Diam. Width	Emergency Brake. No. Diam. Width	Water, Gallons (Brit.)	Petrol, Gallons (Brit.)
1 FWD 1½-ton Model G.....	28.9	4	4½	5	Gear Ratio	Gear Ratio	Gear Ratio	Gear Ratio	Gear Ratio	No.-In.	No.-In.		
2 FWD 3-ton Model B.....	36.1	4	4½	5½	35.6:1	17.8:1	8.9:1	.....	36.1:1	8x1½	13½x2	6.6	21
3 FWD 5-6-ton.....	44.2	4	5½	7	46:1	22.5:1	12.1:1	.....	55.3:1	10x3½	15¼x2¾	.....	21
4 Jeffery Quad Model 4016.....	28.9	4	4½	5½	42.3:1	24.7:1	14.05:1	8.5:1	45:1	10x4	15.9x4	9.2	22
5 Walter Super-quad 3-ton Model.....	30.6	4	4½	6	67:1	27:1	13.6:1	8.4:1	51:1	4x6¾x2½	1x8x2½	.....	25
6 Walter Super-quad 5-ton Model.....	30.6	4	4½	6	67:1	27:1	13.6:1	8.4:1	51:1	2x12x4	1x10x3½	.....	25
7 Walter Super-quad Tractor.....	30.6	4	4½	6	67:1	27:1	13.6:1	8.4:1	51:1	2x12x4	1x10x3½	.....	21
8 Couple-Gear 3½-ton Model HC.....	40	4	5	5½	25:1	.....	.....	.....	25:1	4x17x2	Electric	.....	17
9 Couple-Gear 5-ton Model AC.....	40	4	5	6	25:1	.....	.....	.....	25:1	4x17x2	Electric	.....	17
10 Couple-Gear Electric 5-ton Model A.....	18-h.p. battery of 44 cells 33 plates ea.				25:1	.....	.....	.....	25:1	4x17x2	Electric	.....	.....
11 Couple-Gear Electric 3½-ton Model H.....	9-h.p. battery of 44 cells 17 plates ea.				25:1	.....	.....	.....	25:1	4x17x2	Electric	.....	.....

\*Geared to 16 m.p.h.



Wheel and Chain-Track Compared



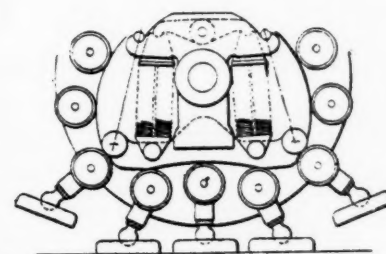
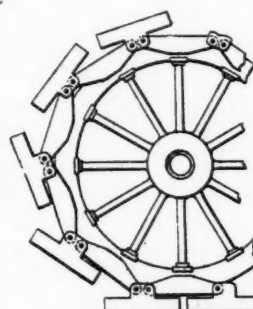
Boydell Girdle

description given is remarkably clear and precise; in fact, almost unaltered, it applies to the greater number of chain-track tractors of to-day.

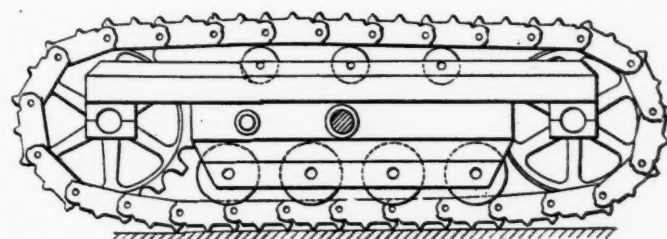
The Motor Car Acts of 1896 and 1903, while affecting the restrictions on light locomotives, had little, if any, direct influence on the development of chain-track tractors. This type of vehicle owes its development to the very great difficulties presented to wheeled tractors by bad surfaces of road or land.

The necessity for traveling over various kinds of land in moving from place to place has demonstrated the capacity of these vehicles for haulage across alkali and other deserts as well as over clay. To enable chain-track tractors to run on soft or swampy land the insistent weight has been reduced much below that imposed by a horse, which, carried on two feet as in walking, may exert a pressure on the ground of from 20 lb. to 25 lb. per square inch. In fact, many of these machines can be run safely over marsh in which a man would sink to his waist. The pressure exerted by a man when standing on the sole of one boot varies considerably, but may be taken as from 6 lb. to 7 lb. per square inch. Some of the chain-track tractors designed for soft ground have an insistent load of less than 4 lb. per square inch, while in others, specially designed for swampy country and fitted with tracks of abnormal width, this figure falls as low as 1.8 lb. per square inch.

(To be continued)



Heavy Transport Girdle (1914) and Early Form Pedrail (Diplock)



Supporting Rollers with Axes Fixed Relatively to Truck Frames (Creep-Grip)

# AUTOMOTIVE INDUSTRIES

*AUTOMOBILE*

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## Methods of Kerosene Carburetion

THERE seem to be two schools of thought among the engineers engaged in the development of vaporizing systems for heavy fuels. One school advocates the application of so much heat to the fuel and air passing through the carbureter or vaporizing device that all of the fuel becomes completely vaporized, and to so arrange the inlet passages that there is no chance for it to recondense on its way to the cylinders. The other school objects to this method because it involves the use of such high temperatures that the charge entering the cylinders will be unduly expanded and the volumetric efficiency, in consequence, will be very low. For instance, to completely vaporize kerosene at normal atmospheric pressure requires a temperature of over 500 deg. Fahr., and when air is raised from 60 deg. to 500 deg. Fahr. it expands 80 per cent in volume. This alone would bring the volumetric efficiency down to 55 per cent, and the wire drawing in the inlet passages would decrease it considerably more. Of course, if the fuel is thus thoroughly vaporized there is no difficulty from unequal distribution of the

charge and incomplete combustion. Trouble might be anticipated from preignition, since the mixture, already in the state of a dry gas when entering the cylinders, might be raised to the ignition temperature by the heat of compression. However, with low volumetric efficiency the compression, and hence the heat of compression, is also low, which reduces the danger of preignition.

Those who favor the use of a moderate amount of heat generally mix the fuel in the first place with only a fraction of the air required for its complete combustion. This over-rich mixture is heated to such a temperature as to completely gasify the fuel. Just previous to entering the cylinders the mixture is diluted by means of a stream of cold air, to obtain the proper proportion for complete combustion. Naturally, the admixture of the cold air tends to cause some of the fuel to recondense, but various experiments are resorted to in order to prevent precipitation of the fuel on the walls of the passages and thus prevent unequal distribution. The fuel charge does not enter the cylinder as a saturated gas, but evidently the heat of compression is depended on to revaporize any part of the fuel that may return to the liquid state upon the addition of the cold air.

There is no doubt that in this way a higher volumetric efficiency can be obtained than where the whole of the charge is heated to the temperature above the boiling point of the fuel before entering the cylinders. However, a high volumetric efficiency is not an absolute criterion of the results obtained. If the charge is not in such a state as to permit of its complete combustion the power may be low in spite of large fuel consumption.

It is too early to say which of the two plans of preparing combustible mixtures of heavy liquid fuel is the better one. Each has certain things in its favor and probably it will require extended practical experimentation to determine where the balance of advantages lies.

## Canada's Boost of the Tractor

THE great need for farm tractors in the present crisis is aptly illustrated by the action of the Canadian government in removing the import tax from tractors selling at less than \$1,400. Canada is a country of great agricultural possibilities, but its development has been retarded during the past few years by the scarcity of farm labor. The use of tractors, capable of plowing perhaps 10 acres per day each, instead of the 2 or 3 acres turned over in a day by a horse plow, permits of greatly increasing the tilled acreage with the available supply of labor. One of the provincial governments of the Dominion began last year to supply tractors to farmers at so much an acre. The inference is that a large number of Canadian farmers have not the necessary capital to purchase tractors. Practically all tractors have to come from the United States, and as a very considerable import tax and war tax have had to be paid on them, the cost of a tractor to a Canadian farmer has been very much more than the cost of the same machine in the United States. The removal



of the tax will result in a material reduction of tractor prices in Canada and should induce many farmers to buy who formerly regarded a tractor beyond their means.

## Curtailment Effect

FOR the first time since curtailment rumors began to spring up in the industry, manufacturers feel that they are on a sound business basis with the Government. They now know exactly to what extent output is to be reduced, and, happily enough, this reduction is about the same as that which would have come about automatically through the acceptance of government work and lack of shipping facilities.

In other words, had no agreement been reached reducing output 30 per cent, the manufacturers would have had to cut to that extent anyway, but they would have been uncertain regarding further restrictions, and, consequently, would have been in a panicky state of mind, rather than in a condition to survey the future with calm confidence.

It is, of course, certain that with reduced production and with an unabated demand, cars are going to be scarce during the coming summer. This condition will affect the dealer far more than the manufacturer, and dealers will have to turn to other lines to increase their income. Throughout the farming districts dealers already have turned to the handling of tractors. In the metropolitan district there has been increased activity in truck sales, and some far-sighted dealers have either added a truck to their line or abandoned passenger cars altogether to concentrate on the sale of trucks.

The effect of the curtailment agreement has been simply to clear the atmosphere. A reduction in manufacturing schedules had already been made and in a great many instances the reduction was appreciably greater than that required by the agreement.

## Airplane Schedule

FROM an annual output of a few hundred units to a monthly output of several thousand is a big jump for any industry. When an industry requiring workmanship of the highest degree experiences such a growth in the course of a few months the event is epoch-making.

It is interesting to note what sources furnished the skilled labor necessary to perform the delicate operations so essential in turning out planes. Nowhere has it been possible to find a body of men better adapted to this sort of work than those engaged in the manufacture of high-class closed bodies. In addition to the thousands of men drawn from this field, many were gathered from the furniture and piano factories, cabinet makers' shops, etc.

America's resources in skilled man-power have never been shown more clearly than in this new work, which is the one branch of government activity fully up to, and in some cases ahead of, schedule. Production of the Liberty engine is going ahead rap-

idly and is keeping pace with wing and fuselage building. The last month has witnessed a turning point in the manufacture of these fighting machines. It is not permissible to publish figures regarding output, but in one mid-Western city alone there are seven plants turning out great quantities of airplane parts and materials. Of these seven not one was previously engaged in airplane manufacture, and three of the plants were not even in existence, but were put up specially to take care of this work.

The airplane schedule is up to date. The tool-designing period is almost over and production is under way in more places than seemed possible only 6 weeks ago. Liberty engine-equipped planes are already in France, and everything points to an unbroken stream of shipments in ever-increasing numbers from now on, providing the shipbuilding schedule can be adhered to.

## Guidance for War Inventors

IT is notorious that inventors as a class are very impractical people and that of all the patents issued by the U. S. Government a very small proportion ever bring enough returns to their inventor to cover the patent office and attorney's fees. There is a certain glamour about the inventor's calling that seems to attract many people who do not possess sufficient mechanical ability and business sense to carry their ventures through successfully.

This lack of the practical spirit among inventors has been very conspicuous, we understand, in the suggestions and inventions submitted to the Naval Consulting Board. It was found that a great many of the suggestions made showed an utter lack of comprehension of the particular problem which it was intended to solve.

The war will offer many opportunities for gifted inventors, as the struggle is chiefly one of the most up-to-date means of transportation and fighting. Although production in the different branches cannot be interfered with, the Government is most anxious to fully consider any promising invention in connection with means for fighting the submarine menace, aircraft and aircraft engines, tanks and similar equipment.

Practically all of these devices are quite new and those who wish to share in their technical development should realize that unless they have had some practical experience in the particular line of work, they must first thoroughly familiarize themselves with the requirements of the problem, the historical development of the device to date and the scientific principles underlying its operation.

In connection with the problems of meeting the submarine peril, the Naval Consulting Board some time ago issued a pamphlet giving in very concise form the various aspects of the subject and outlining various possible solutions. It would not be a bad plan to issue similar pamphlets dealing with aircraft and tank problems in the same way, as it would keep inventors from wasting their energies in attempting the impossible and to guide them into the proper channels for effective work.

# □ Latest News of the

## Wants Fuller Report on Trade

Export Committee of N. A. C. C. Asks Commerce Bureau for Its Co-operation

NEW YORK, March 8—A good active step by way of a scientific investigation into foreign trade and co-operation with the government in this work was started by the export committee of the National Automobile Chamber of Commerce at its meeting yesterday, when it was decided to ask the Bureau of Foreign and Domestic Commerce to secure fuller reports on trade conditions in foreign countries by American consuls and commercial attachés and published by the Bureau. A questionnaire is to be drawn up indicating the particular subjects on which information is most desired by the automobile industry.

Owing to confusion that exists over the licensing of exports of automobile parts containing certain percentages of metals and other articles on the conserved list, the committee decided to ask the War Trade Board to consider the waiving of restrictions on exports of parts, inasmuch as these contain a very small percentage of copper, brass, tin, etc. The exportation of parts for replacements is not an extension of new trade and it is essential to the maintenance of established trade relations that supplies of parts for repairs and replacements should be on hand wherever American cars are sold. The question of licenses on exports to Canada of both cars and parts is also to be taken up with the authorities in Washington so that the requirements will be more definitely understood.

### Proposed Rim Standards

With a view to determining the feasibility of standardizing straight-side tires for export, a questionnaire was drafted by the Export Committee of the N. A. C. C. at a recent meeting, to be sent to the tire companies to ascertain to what extent automobile manufacturers can depend upon their customers in foreign countries obtaining straight-side tires in every place where American cars are used.

With the object of making export trade to foreign countries easier, and reduce sales resistance in Spanish-speaking countries, the chamber was directed to work out the details of a good roads' pamphlet with a view to publishing it in English and Spanish to be distributed in countries where highway improvement is in a backward state.

The chamber has already partly completed a table of equivalents of technical automobile terms in Spanish, French, German and Italian, to be used in the preparation of catalogs, instruction books and other trade literature.

Meetings of the export committee are to be held regularly in future at the time of general meetings of members.

The Board of Directors has authorized delegates to represent the N. A. C. C. at the fifth annual Foreign Trade Convention at Cincinnati, April 18-20, and to deliver an address dealing with ways in which the automobile industry is helping to win the war.

### Ford to Build Light Tanks

DETROIT, March 11—The Ford Motor Co. is going to produce light tanks for the government. It is reported that if the first model, drafted less than 4 days ago and well under construction now, is accepted, the manufacture will be pushed with all speed and the first shipment will be ready within 60 days. It is also reported that the Ford "tank" is to be a comparatively light machine, carrying a driver and a machine gun operator, and will be driven by two gasoline engines of standard type. It will have the familiar creeper type of traction, and while not intended for the heavy work that has been done by the immense British and French tanks at the front, it is expected to be an effective fighting machine.

### Washington Bureau for Milwaukee

MILWAUKEE, March 13—Milwaukee manufacturers, with the co-operation of the Milwaukee County Council of Defense, are raising a fund of \$30,000 by popular subscription to finance the establishment and maintenance of a bureau of information at Washington. The main function will be to give Milwaukee manufacturers information enabling them to make bids on various Government contracts which otherwise might not be available. The bureau is planned as a permanent institution.

### Roads Used by Government Military Highways

WASHINGTON, March 13—A bill before the Senate says all State roads used by the Government should be treated as military highways and the Government should assist in keeping them in repair. The bill was introduced by Senator J. W. Smith, who has investigated the deterioration of the Maryland highway system. The bill states the Government is not to contribute more than two-thirds of the money for repairs, nor more than \$1,000 per mile. It has gone to the Senate Committee on Appropriation.

## Flint Factories Pool Interests

Scheme Worked Out in Co-operation with Y. M. C. A.—All Plants Represented

DETROIT, March 11—Industrial districts in which there are two or more factories can often successfully pool their welfare interests with an increase in economy and more satisfactory results for the men. This method can be used to best advantage in non-competitive centers, that is, where the factories do not compete either in the local labor market or in the sale of their products.

Such an idea has been worked out in Flint. As will be noted, it has been worked out in co-operation with the local Y. M. C. A. This need not necessarily always be the case, but it has worked out to mutual advantage in this instance. The general secretary can be both secretary of the Y. M. C. A. and of the Industrial Fellowship League, as it is called in Flint. The chart is self-explanatory. The general secretary is the nominal manager of the entire enterprise. He receives his instructions in regard to policy from the industrial committee, which is composed of a board of trustees, comprising one member of the industrial committee and two members of the executive board.

The executive board is composed of one representative from each of the plants in the district, and this executive board co-operates with the industrial secretary, who represents the industrial committee in such work as the educational activities and shop benefits, as well as athletic and social events. The work of the industrial committee is divided into two parts, one being educational and the other recreational. The educational activities comprise the holding of evening classes, shop meetings, technical society meetings and lectures. The recreational activities are of an athletic and social nature, including the arrangement of community games and of city stadium games, supervision of athletic activities and the provision of recreation resorts.

Besides these two main divisions there are independent organizations which comprise various factory committees of a welfare nature, a committee of general supervision for welfare work, a committee of factory stores in which small articles are sold to employees, and a committee which has to do with the handling of a factory newspaper, which acts as an organ to further the work of the Fellowship League.



# Automotive Industries □

## Trucks Get Attention of N. A. C. C.

Organization Decides to Make  
Commercial Vehicle a  
Real Factor

NEW YORK, March 8—The motor truck seems to be coming into its own so far as the National Automobile Chamber of Commerce is concerned, after having been held in too much subjection by that organization since its inception. At its meeting held this week the chamber decided to put the motor truck on its feet as a real factor in the organization, and with this object in view two classes of membership, a truck division and a passenger car division, with two second vice-presidents in charge, Windsor T. White in charge of the truck classification and H. H. Rice in charge of passenger cars, were formed.

For several years there has been constant uneasiness among many truck makers due to the feeling that the chamber has not been giving that attention to the truck industry which it merited. Recently there have been truck meetings at which the subject of a national truck organization has been discussed and it is not surprising that a comprehensive truck program has been mapped out.

The motor truck show, which was opposed so consistently by the chamber and the ban put on it in New York and Chicago, has come in for recognition and while no definite announcement has been made, the subject was discussed in a preliminary way. Since the truck show was suppressed in New York and Chicago the truck show idea has been very successfully carried on in Boston, Minneapolis, Kansas City, Brooklyn and other cities.

Frequent regular meetings of representatives of the forty-five commercial vehicle manufacturing companies included in the membership of the National Automobile Chamber of Commerce were agreed upon at a meeting of this division of the chamber following the general meeting of members.

Many motor truck makers have been admitted as new members during the past year and one of the principal objects of the regular sessions is to promote greater personal acquaintance among them and afford opportunities for discussing their particular problems, such as have been enjoyed by most of the passenger car manufacturers in the chamber for many years. The meetings will be held in the afternoon of the same days as the general meetings.

A great deal of the activity of the chamber, and of committees representing

it in Washington, centers around motor trucks and it is recognized that this branch of the industry has assumed much greater importance than heretofore and that it is confronted with problems all its own.

A resolution was passed calling upon the chairman to appoint a committee of three to investigate and report upon plans for selling motor trucks on the time-payment basis, the consignment of motor trucks to dealers and the consigning of parts to dealers.

### Liberty Seaplane Passes All Tests

WASHINGTON, March 14—The first United States Navy fighting seaplane equipped with a Liberty engine has been tried and accepted, and a large number are now being delivered to the Naval Air Service. These will be used in submarine hunting.

The navy is also using what is called the Bristol model fighting plane, and another 2-seated flying boat. The naval Liberty planes are equipped with two Liberty engines, giving a total of 700 hp. This is greatly in excess of the power of British craft.

It has been announced that the last minor defect in the Liberty engine, which was in the lubrication, has been overcome.

### More Power for American Tanks

WASHINGTON, March 11—An official report states that American super-tanks now under construction are greater in power and destructive force than any British or French tanks. They will withstand the fire of small German artillery which damage the French and English tanks.

While gross tonnage of the big tanks being made here exceeds that of the English by only 2.8 per cent, ours have engines three times as powerful, and in addition to its crew can carry a force of 20 men to do trench work. It is said that the super-tanks can span 10-foot trenches. Armament will consist of small cannon and machine guns. A conning tower will permit the latter to shoot in any direction. Owing to the great weight the tanks will travel a maximum speed of 5 miles per hour.

### 100,000 Men for Ford Tractor Work

DETROIT, March 13—Henry Ford will eventually employ 100,000 men in the manufacture and distribution of his tractors. At the Dearborn plant, which is temporary, 2000 men are now working, but this number will soon be increased to 25,000. Following the building of a permanent \$3,500,000 plant, the distributing shop will be used as one of the numerous assembling plants.

## Civilian Control for Airplanes

Authority to Be Taken from  
Military Officials—Program  
Must Be Speeded Up

WASHINGTON, March 14—Control over airplane production will, within a few days, pass entirely or almost entirely out of the hands of General Squier, and will be put in the hands of civilian manufacturers. Details of the plan have not been worked out, but the whole subject will be investigated by a committee of three, with H. Snowden Marshall as chairman.

The appointment of this committee followed the disclosure to the Senate Military Committee that only one-tenth of the airplanes promised by this country for service on the Western front early this spring would be ready by April 1. The request for this investigation was made by Howard Coffin.

### Gifford Acting Director

Coincident with this announcement Walter S. Gifford, Director of the Council of National Defense, has been appointed Acting Director of the Aircraft Board and will have charge of executive details in the absence of Mr. Coffin who will go with the committee of investigation to see for himself just what conditions are. Mr. Gifford will retain his directorship in the Council of National Defense but spend his time at the Aircraft Board for the present. Howard E. Coffin stated to-day that despite all rumors good production is now had on the eight-cylinder Liberty airplane, and a number of the fighting planes of the twelve-cylinder type have been completed and are flying. He added that the production of the fighting planes would be in the thousands within the next few months.

### Appropriation for 22,000 Planes

Congress originally voted appropriation for 22,000 airplanes of which 7000 are to be the light training planes equipped with engines other than the Liberty, and the other 15,000 are to be divided in quantities using the eight-cylinder and twelve-cylinder Liberty engine types.

The Senate Military Affairs Committee's investigation of the airplane program and other outside pressure are said to have had some influence in bringing the Presidential announcement of the new committee.

The aircraft board at present has no power over contracts nor engineering, but is supposed to stimulate production.

## Curtailed Schedule Not Harmful

Has Clarified Industry by Allowing Factories to Make Definite Distribution Plans

DETROIT, March 11—The curtailed schedule which the National Automobile Chamber of Commerce has announced through its fuel committee and the War Industries Board, as reported in last week's issue of AUTOMOTIVE INDUSTRIES, has had a remarkably clarifying effect on the factories throughout the middle west.

The most tangible result which can be predicted by the factories here is a scarcity of cars during the summer. It is calculated that the output of the factories will not fill by 50 per cent the demand of buyers throughout the country for passenger automobiles.

The ruling made by the War Industries Board has had no internal effect on the factories, inasmuch as nearly all of them were working on a reduced schedule when the word of the definite curtailment order was received. Therefore, the only effect that the order had was to permit manufacturers to go ahead and outline their future policies with the dealers, in order to make as fair a distribution of their products as possible.

It can readily be predicted that the shortage in automobiles will begin to make itself keenly felt by the middle of May. March and April are bad for drive-aways because the roads through the factory districts are nearly all gravel, and a little sunshine and rain soon reduces them to a mass of mud.

With the embargo situation as it stands at present, although matters are somewhat easier than they were during the past months, it is difficult to obtain a small percentage of the freight cars needed to ship away the normal production of the factory. This contemplated shortage of freight cars and the difficulty in drive-aways make the car situation one without parallel in the history of the industry. It is certain that dealers who have not been foresighted sufficiently to lay in a stock of cars in advance are going to feel the pinch.

Far-seeing factory officials have noted that this will have a corresponding effect on the used car industry. As a result distributors in many cases have taken advantage of the lull in sales to fit up the used cars in presentable shape for spring and summer business. It has also been reported that syndicates in certain localities have been buying up used cars to create a modified corner on the market. Nothing definite, however, has been found out regarding this situation.

The automobile market is, of course, elastic in that purchasers do not require immediate delivery when they can keep on using their old cars after the time when they would ordinarily purchase a new one. The delay, however, only increases the coming market, as the potential demand is still there.

Some manufacturers believe that one of the possible effects of the curtailment order, coupled with the big demand which is sure to occur during the coming season, is that local assembling plants will spring up throughout the country, each attempting to fill the market immediately surrounding it.

The motor truck business is reported good everywhere. All the factories engaged in this business here are operating at top production.

Trucks are leaving singly and in trains from all points of Michigan to the South, East and West. Many go weekly by way of Toledo, and a plan is now being considered whereby all trucks bound for the seaboard will carry munitions. The plan is to load every truck to capacity with articles indicated by the government officials, and to deliver them at the seaboard. Then the truck will go to the eastern distributor who has ordered it. If carried out, this will relieve the railroad of thousands of tons of freight and will insure more prompt delivery of the truck than would be possible by freight car shipment.

### Ford Sub-Chaser to Be Ready This Summer

WASHINGTON, March 8—The first submarine destroyer built by Henry Ford for the United States Navy will be ready for its trial trip early this summer. Several boats have been contracted for, but they will not be in quantity production until the one now under construction has been tried out.

### Signal Truck Requires More Capital

DETROIT, March 13—The officers of the Signal Motor Truck Co. have notified stockholders that additional capital is required to carry the business forward successfully and profitably. It is stated in the notification that a proposition has been submitted by outside interests to supply credit up to \$250,000 under the following general terms and conditions:

1. The par value of all common stock be decreased from \$10 to \$5 and that each stockholder be entitled to one share of the capital stock of the company so reduced in par value for each share now held by such stockholder; the balance thereof to be given as compensation for financial assistance offered.
2. The management and control of the company for the term of the agreement to be under the direct supervision of these interests which will receive 2½ per cent of the gross business transacted by the company as additional compensation.
3. The common stock of the company to be increased by 50,000 shares of \$5 par value to be sold to these interests at their option at not less than par. Proceeds of such sale, if consummated, to be placed in the treasury of the company for the profit of all stockholders.
4. Preferred stockholders to agree to waive dividends and all rights thereto until Sept. 1, 1918.

As was recently reported in AUTOMOTIVE INDUSTRIES, the Paige-Detroit Motor Car Co. has made an offer to purchase the assets and business of the Signal Motor Truck Co. It is uncertain at the present time whether the stockholders of the Signal company will decide to continue the business for themselves, or will, on the other hand, sell out to the Paige company.

## Studebaker Profits Decline

Drop of 60 Per Cent in 1917—Partly Due to War-Time Prices and Schedules

DETROIT, March 12—The report of the Studebaker Corp. and its subsidiary companies for 1917 shows total sales of \$50,147,516, which is \$11,841,078 or 24 per cent less than the 1916 amount. Net profits declined from \$8,611,245 in 1916 to \$3,500,741 last year, a drop of 59 per cent. The net earnings for 1917 amount to 9 per cent on the \$30,000,000 common stock as compared with 26 per cent in 1916. Last August the dividend was cut from 10 to 4 per cent. A. R. Erskine, president of the company, attributes the heavy loss in gross business and profits partly to unsettled conditions after America's entrance into the war, and partly to the company's concentration of attention on government orders and shipments, with the result that the manufacturing schedule of motor vehicles was reduced, and the plant rearranged on a war basis. Cost of financing operations increased, and to carry the heavy surplus inventory investments, the company obtained bank loans which reached a maximum of \$13,231,500, an increase of \$7,000,000 over the average of 1916. Before the end of the year, this maximum was reduced to \$7,400,000.

The net income account and consolidated balance sheet, as of Dec. 31, 1917, compare as follows:

	1917.	1916.	1915.
Net sales....	\$50,147,516	\$61,988,594	\$56,539,096
Mfg. costs, etc.	45,788,099	53,467,867	47,443,574
Oper. prof.	\$4,359,417	\$8,520,727	\$9,095,432
Other inc....	.....	90,518	152,943
Total inc..	\$4,359,417	\$8,611,245	\$9,248,375
Interest, etc..	298,488	.....	180,950
War taxes....	560,188	.....	.....
Net prof...*	\$3,500,741	\$8,611,245	\$9,067,425
Pr. divs.....	767,550	767,550	830,445
Com. divs....	2,100,000	3,000,000	1,396,580
Sur. for yr.	\$633,190	\$4,843,695	\$6,840,400
Assets—	1917.	1916.	1915.
Plant, etc..†	\$15,477,186	\$13,437,983	\$12,400,493
Goodwill, etc.	19,807,277	19,807,277	19,807,277
Cash .....	2,528,555	3,196,703	5,910,062
Investments.	847,672	1,142,044	1,570,099
Accts. & nts. receivable..	9,325,499	9,428,391	8,585,199
Inventories..	21,322,134	21,477,657	13,062,041
Fed. chgs....	358,684	235,493	161,445
Total .....	\$69,667,007	\$68,725,549	\$61,496,617
Liabilities—			
Pr. stock....	\$10,965,000	\$10,965,000	\$10,965,000
Com. stock...	30,000,000	30,000,000	30,000,000
Notes pay....	7,400,000	4,000,000	2,305,500
Acct. pay....	2,080,086	3,542,886	2,770,057
Advances ...	285,212	342,111	504,895
Fed. tax res..	588,589	.....	.....
Sundry cred.	543,389	1,964,694	1,890,095
Contnl. res...	1,358,237	1,358,237	1,500,000
Spec'l surp...	2,548,654	2,548,654	2,548,654
Surplus .....	13,947,838	13,314,647	8,470,952
Total .....	\$69,667,007	\$68,725,549	\$61,496,617

\*After \$767,550 preferred dividends there was a balance of \$2,733,191 applicable to the \$30,000,000 common stock, which was equal to \$9.11 a share.

†Valuation after depreciation.



## Michigan Buys 1000 Tractors

### Ford Machines Will Be Sold Under Restrictions to Farmers by State

DETROIT, March 11—The State of Michigan has purchased from Henry Ford & Son 1000 Ford tractors for delivery beginning April 1. At the same time through Henry Ford arrangements were started for the purchase of a large number of plows to be attached to the tractors. These plows are made by the Oliver Plow Co., South Bend, Ind., and Mr. Ford has personally guaranteed that the state will be able to obtain them. The tractors and plows will be sold to the farmers of the state through the War Preparedness Board, and it is hoped that their use will increase the acreage of Michigan farms for 1918 crops. The tractors and plows will be under control of the board at all time, and will be used practically as community implements. The farmer who buys the machinery is expected to plow his neighbor's field, and the state will see that he does so.

#### Plan Suggested by Ford

This plan has been adopted at the suggestion of Henry Ford himself. In fact, it is stated that the sale of tractors and plows hinges upon this agreement. The amount of money involved in the transaction amounts to practically \$830,000. The tractors are to be paid for at the rate of \$750 each, while the plows cost approximately \$100 each. Delivery is promised beginning April 1 at the rate of twenty-five a day, which will take one-quarter of the output of Henry Ford & Son's factory at that time. It has been further agreed that if the 1000 tractors prove insufficient, Henry Ford & Son will allow the War Board to have another 1000 at the same price, provided their distribution and use are as planned in agreement above mentioned.

#### Devising Distribution Scheme

The secretary of the War Board at Lansing is at the present time devising a scheme for distributing the tractors and plows. This contemplates sales by county agents, for cash only, but when a farmer buys the twin implement he makes a contract to plow his neighbor's field within a certain radius. This work, and the price for which it will be done, will be directed by the agents of the War Board. In this way the board believes the entire acreage of the state can be plowed.

#### Dearborn Meeting Held

A meeting was held at the Dearborn plant on March 9 with members of the State War Board present, to go over the details. At that time Henry Ford said that the state must see to it that the tractors and the plows are kept going from spring until fall. It is

aimed to have neither the tractor nor the plow idle any longer than necessary.

From an acreage standpoint it is believed that the use of these tractors on a community basis will greatly increase the output of the Michigan farms. With 1000 tractors each able to plow an acre an hour, it would mean the maximum attainable effort of 1000 acres per hour, or 10,000 acres per day. The amount which the state will allow per acre for plowing is said to be about \$2.

#### Detroit Valve and Detroit Brass Earn \$348,424

DETROIT, March 11—The two units, Detroit Valve & Fittings Co. and Detroit Brass Works, operating as one corporation, earned \$348,424.35 last year. Their gross sales amounted to \$3,065,733, an increase of \$411,554.56 over 1916, when the companies operated separately. After paying dividends amounting to \$65,301.25 and setting aside \$54,000 as reserve for federal income and excess profits taxes, the sum carried to surplus was \$185,128.83. This increased the accumulated surplus to \$295,200.78 on Jan. 1, 1918. The company's balance sheet shows:

Total resources.....	\$1,710,846.28
Current assets.....	1,053,840.09
Working capital.....	838,744.59

#### Assets:

Accounts receivable.....	322,216.40
Bills receivable.....	2,125.84
Cash on hand.....	31,255.61
Prepaid insurance.....	6,709.19
Inventory.....	691,533.95

#### Current liabilities:

Accounts payable.....	60,095.50
Bills payable.....	155,000.00
Plant investment.....	657,005.29
Outstanding capital stock.....	1,146,550.00

#### Boston Has \$10,000,000 Sales Show

BOSTON, March 8—More than 225,000 visitors and 3500 New England dealers attended the Boston show, which closed last night. A new record was made for sales during the week. Between the dealers signed up and retail orders, the volume of business done amounted to at least \$10,000,000. One of the most noticeable factors was the tendency of passenger car dealers to obtain truck agencies in conjunction with their regular line.

#### Cleveland S. A. E. to Meet March 15

CLEVELAND, March 11—The next meeting of the Cleveland Section of the Society of Automotive Engineers will be held on Friday, March 15, at the Hotel Statler. Charles Tewksbury, of the Electric Tractor Co., will give a talk illustrated with slides and moving pictures on their creeper type of agricultural tractor.

#### Tractors to Haul Boats

WASHINGTON, March 11—Tractors will probably be used to haul boats carrying coal over the Chesapeake and Ohio Canal from Cumberland, Md., to the capital. Army officials are now surveying the canal to determine the feasibility of this plan and terminal facilities.

## England Revises Gas Restrictions

### Latest Regulations Allow Only 10 Gallons a Month for Commercial Cars

LONDON, ENGLAND, Feb. 16—The latest regulations with regard to the use of gasoline in connection with gasoline licenses limits the amount as follows:

Passenger Cars—No fuel for ordinary purposes designated pleasure cars.

For business purposes not exceeding 10 gals. per month.

Motor Cycles—not exceeding 2 gals. per month.

Physicians' Cars—Not exceeding 50 gals. per month.

Commercial Vehicles—The amount depends upon the load-carrying capacity and the monthly mileage. The scale, which is a general guide for allowances, is as follows:

Useful Load, Tons	Miles per Gal.	Miles per Month	Gals. per Month
1	13	1,200	85
1½	11	1,100	95
2	9½	1,000	105
2½	8	950	120
3	6	900	150
4	5½	900	155
5	5½	850	165
6	4¾	800	176

Delivery Wagons—For light-capacity delivery wagons 24 to 30 gals. per month.

Taxicabs—Forty to 60 gals. per month, according to the size of the city or town.

Passenger Buses—Approximately 45 per cent of the estimated requirements in June, 1916.

Renting Automobiles—Approximately 20 to 30 gals. per car per month, the amount depending upon the number of cars owned by the applicant.

In connection with the sale of gasoline, the Board of Trade, under the Defense of the Realms regulations, which limit the retail prices of all motor fuels, has placed a profit on gasoline sold by retailers at 10 cents per gallon above the cost. This order also limits the price of kerosene to 8 cents per gallon above its cost to the retailers.

For some time the price of gasoline has been limited to 15 per cent by agreement between the importers and the Motor Trade Assn., which is an organization of motor interests. The new order gives legal sanction to the price and also places the maximum profit at 10 cents per gallon.

#### Michigan Roads Meeting Postponed

DETROIT, March 11—The postponed annual meeting of the Michigan State Good Roads Assn. will be held here in September. The Michigan State Highway Department and the Highway Engineering Department of the State University will promote instructive features. The completion of the good roads system in Michigan will be considered and a tour of the highways of Wayne County will be a feature of the meeting.

## England Trying to Evolve Suitable Tractors

Comprehensive Research Work Needed—Board of Agriculture Has Scheme for Establishing Institute of Mechanism

LONDON, ENGLAND, Jan. 15—The present tractor situation is creating a fairly widespread feeling in Great Britain to the effect that a great deal of comprehensive research work is needed in order to evolve tractors absolutely suited for use in the British Isles. The Board of Agriculture is busy with a scheme for founding an Institute of Agricultural Mechanism for the conduct of researches. It is conceivable that tractor manufacturers will also form a Research Association, with financial help from the Government. There is no branch of the motor industry in which a study of local conditions and the establishment of principles based upon those conditions is so necessary, and many machines which no doubt do admirable work in the districts for which they were primarily designed have secured by no means enviable reputations on British farms.

With regard to the question of whether farm tractors ought also to be suitable for road haulage, the general trend of opinion appears to be in favor of designing for field work only. A good deal depends on the modifications that may be made in British law as applied to road vehicles. At present springing of front and back axle is essential. This is probably also desirable from a mechanical standpoint, because the roads are hard and an unsprung machine shakes itself to bits very rapidly.

### Tires and Rims Regulated

There are also stringent regulations, the operation of which is only temporarily suspended, as to the design of tires and rims. A tractor intended for general purpose work in Great Britain should be so designed that the spuds or other fittings can be very rapidly applied or removed. For road haulage, something nearly approaching a smooth tire must be provided. There must also be two independent systems of brakes, each adequate in itself to hold the tractor and its loaded trailer on a steep gradient upon a hard road.

Small fields are so common that there is much of the time wasted in turning at headlands, and a strong feeling is growing up in favor of the introduction of what might be called a double-ended tractor, running at equal speeds in either direction and working in connection with balanced plows.

It is too early as yet to attempt to indicate the degree of success attending the British Government's scheme for extensive ploughing by tractor, but one or two points of interest and importance are gradually emerging from a position that has been somewhat chaotic. It will be remembered that, following upon the demonstrations of agricultural tractors which took place in Scotland in October last, the Committee of Observers emphasized in its report the strong de-

sirability of securing light tractors of ample engine power. It was stipulated that the ideal general purpose tractor for use in Scotland should develop not less than 20 B.h.p. and should weigh not more than 30 cwt. Many manufacturers on both sides of the Atlantic have adhered to the view that weight cannot advantageously be reduced to anything much below 2 cwt. per horsepower. It has been contended that, under many circumstances, any excess of power could not be utilized, but practical results appear to be going against this conclusion.

### Must Be a Compromise

If we admit that the ideal arrangement would be to design one type of tractor for light land and another for heavy land, we are faced with the fact that both classes of land are not infrequently found in the same field. Therefore we must compromise, or else, when heavy land is encountered, we must use a plough with fewer breasts. The best compromise appears to be found in the light and powerful tractor, the wheels of which are fitted with a large number of spuds, fairly sharp and long but not very wide, and arranged in diagonal sets so that some are always getting a good grip. Blunt attachments waste power in compressing the soil, and spuds ranging from side to side of the rim are apt to get clogged up and to become inefficient.

Opinion generally is turning in favor of using a type of tractor suited to run with one driving wheel in the furrow. Under these circumstances it is felt that the lateral movement of spuds through the ground has generally a beneficial sub-soiling effect. Also that this position brings the wheel generally on to firmer and drier ground.

It is very difficult to get a reliable indication of the official view held in Great Britain on such points as those mentioned, but the writer is strongly of the opinion that the great majority of experts who have been concerned with the Government scheme of ploughing favor the light powerful tractor running with one wheel in the furrow.

On the subject of chain tracks and kindred devices opinions differ. The Committee of the Scottish Trials was not favorable to this method of propulsion, emphasizing the probability of rapid wear and tear and apparently failing to see any compensating advantage in improved foothold or reduced compression of the soil. Others equally qualified to judge regard the chain track as giving the best grip on a loose or slippery surface and as affording at least a fairly satisfactory means of avoiding the bad results of compression when heavy soil is moist or wet. Such soil, under these conditions, when subjected to compression form a paste from which a good seed-bed cannot be obtained and which

may take years to eradicate. Such considerations are forcing us to a realization of the desirability of making fuller use of the speed capacities of farm tractors. This in turn means the employment of specially designed tractor ploughs in place of the old horse ploughs, the work of which is often very bad if they are hauled at more than 2 miles per hour. The great point is, of course, to make use of the adherent advantage of the tractor that it can, if given the chance, do its work very rapidly when weather conditions are such that the texture of the soil is just right.

### Detroit-Pontiac Truck Line

DETROIT, March 12—Pontiac is connected with this city by a motor truck line operated and owned by the General Storage & Cartage Co., Inc., of Detroit. The present service is intended for bulk tonnage, but package service will be installed soon. Five motor trucks of from 5- to 10-ton capacity have been assigned to the service. The trip between the cities can be made in two hours, and the charge for service, in cents per hundred pounds, ranges from 9 cents for fifth class to 18.8 cents for first class deliveries.

### 2 New C. M. Lamps

DETROIT, March 12—The C. M. Lamp Co. is working on two new lamps—one for seaplanes and the other an acetylene lamp for tractors. The company reports its March business will be 100 per cent more than last month, and the February business was double that of January. An \$800,000 government order for booster jackets was placed with the Kenosha plant and a smaller order was given the Detroit plant. The company states it has enough steel at both plants to last six months.

### 10 Munitions Districts for U. S.

WASHINGTON, March 13—To bring about decentralization, and closer contact with munitions manufacturers, the Ordnance Department has divided the country into munitions districts with headquarters for the different zones at Pittsburgh, Cleveland, Rochester, Boston, New Haven, Detroit, Cincinnati, Chicago, New York and Philadelphia. A district chief of production will be located in each of these cities.

### Airplane Mail Service Delayed

WASHINGTON, March 12—The start of the airplane mail service between Washington, Philadelphia and New York will probably be delayed until May 15, because landing fields have not yet been found at Philadelphia and New York. It was originally planned to begin the service April 15, with army aviators as pilots and a daily trip between the cities each way. It is stated that the League Island field at Philadelphia was not found available, and a committee of army fliers and postal officials will begin investigation of other Philadelphia sites.



New York sites will be inspected after that. At present the airplanes require starting and landing fields 2000 ft. square, but the Post Office Department is experimenting with devices to allow starting and landing of airplanes on smaller fields and possibly on the roofs of large buildings.

#### Truck Supply Service Postponed

WASHINGTON, March 13—The proposed automobile supply service by motor truck between the Quartermaster Depot at Philadelphia and the Marine Camp at Quantico, Va., via Washington and Baltimore, has been postponed because of the bad road conditions between Quantico and Washington. It is possible this service may be established early in May.

#### Electric Storage Battery Earns 14 Per Cent

PHILADELPHIA, March 13—In a preliminary report of the Electric Storage Battery Co. for the fiscal year ended Dec. 31, 1917, net profits of \$1,207,061 for the first half, or 14 per cent per annum on the common stock, are shown. Although the rate for the second half may not have been as high, and deductions for taxes may modify the final figures, the 1917 earnings are far beyond those of any other year. In 1916 this amounted to 9.7 per cent, in 1915 8.4 per cent, and before this averaged 7 per cent. Most of the company's expansion is represented largely by government contracts.

#### Overland Price Increase in April

TOLEDO, March 9—The Willys-Overland Co. has sent out a telegram to all dealers stating that all orders made after March 1 will be shipped and driven away during March if possible. After April 1 prices are scheduled for an increase, although no announcement is made regarding when the new prices go into effect or what the increase will be. C. A. Earl, vice-president of the Willys-Overland Co., has informed representatives of Automotive Industries that a price increase is certain after that date.

#### United States Truck Prices Raised

CINCINNATI, March 8—The United States Motor Truck Co. has increased its prices, to take effect on and after April 15. The prices follow:

Model	New Price	Old Price
E, 2½-ton chain drive..	\$2,800	\$2,650
H, 2½-ton worm drive..	3,250	2,950
D, 3½-ton chain drive..	3,500	3,350
J, 3½-ton worm drive..	3,950	3,650
K, 5-ton worm drive....	4,850	4,550

#### Vocational Training Outlined

WASHINGTON, March 12—The Federal Board for Vocational Education has issued Bulletin No. 7, which gives outlines and suggestions for a course designed to qualify men as skilled chauffeurs or motor truck drivers. The bulletin covers the complete course which is to be used in the various Army training schools.

## Peerless Profits Are \$1,065,869

Equal to 10.6 Per Cent on Common—Sales Aggregate \$18,924,451, 39 Per Cent More Than 1916

NEW YORK, March 12—The annual report of the Peerless Truck & Motor Corp. shows net sales of \$18,924,451, exclusive of munitions contracts, an increase of \$5,399,428 over 1916. Profits, after the deduction of interest and reserve for depreciation, losses and taxes, amount to \$1,065,869, or 10.6 per cent of the \$10,000,000 outstanding common stock, as compared with \$1,356,358, or 13 per cent, in 1916.

The consolidated balance sheet, as of Dec. 31, 1917, follows:

ASSETS	
Land, Plant, Buildings and Equipment, Less Depreciation:	
Balance at Jan. 1, 1917.....	\$4,891,680.43
Net reduction during year....	713,518.10
	\$4,178,162.33
Less: Amount charged off for depreciation for year.....	291,848.68
Balance at Dec. 31, 1917.....	\$3,886,313.65
Patents, franchises and good will, including cost of acquisition of stocks of subsidiary companies .....	3,710,520.00
Current assets:	
Cash in banks and on hand..	2,869,569.43
Marketable securities at current quotations .....	192,980.00
Inventories of finished product, work in process, raw materials and supplies valued at cost or market, whichever is lower .....	5,318,743.29
General Vehicle Co., Ltd., London, investment and current account, less reserve .....	63,412.68
Sundry debtors .....	111,298.69
Accounts and notes receivable, less reserves, including documentary drafts in process of collection, per contra .....	2,098,204.83
Total current assets .....	\$10,654,208.97
Bankers' Trust Company, Trustee:	
Cash deposited under trust agreement to acquire balance of stock outstanding of The Peerless Motor Car Company .....	29,190.00
Deferred assets:	
Prepaid expenses and insurance .....	43,676.31
	\$18,323,908.93

LIABILITIES	
Capital .....	\$4,898,110.20
Representing consideration received in cash for the following capital stock issued as full paid and non-assessable in terms of financial plans filed in accordance with the Statutes of Virginia:	
Capital stock authorized:	
400,000 shares of \$50 each..	20,000,000.00
Whereof issued and outstanding:	
200,000 shares of \$50 each..	10,000,000.00
The Peerless Motor Car Company:	
7 per cent cumulative preferred stock, outstanding in hands of public, 278 shares of \$100 each.....	27,800.00
Funded debt:	
Peerless Truck and Motor Corporation Ten Year 6 per cent secured convertible gold notes .....	5,000,000.00
Subsidiary companies .....	280,000.00
	\$5,280,000.00

Current liabilities:	
Accounts payable .....	1,264,413.81
Documentary drafts discounted, per contra.....	1,044,891.56
Sundry creditors and reserves, including reserves for Federal taxes.....	716,859.36
Total current liabilities ...	3,026,164.73
Special reserve for contingencies* .....	719,915.84
Surplus:	
Current surplus:	
Balance at Jan. 1, 1917 (whereof accrued prior to Nov. 10, 1915, \$1,018,358.77) .....	2,575,595.37
Add: Net profit for the year, as per profit and loss account, after provision for estimated requirements for Federal excess profits tax and income tax, year 1917.....	949,483.27
	\$3,525,078.64
Deduct: Dividends on preferred stock of The Peerless Motor Car Company in hands of public.....	1,946.00
Balance, Dec. 31, 1917.....	\$3,523,132.64
Surplus capital, General Vehicle Co., Inc.:	
Balance at Jan. 1, 1917.....	848,785.52
Total surplus, Dec. 31, 1917.....	4,371,918.16
	\$18,323,908.93

The consolidated profit and loss account for 1917 follows:	
Net sales, excluding munitions and special contracts of the General Vehicle Co., Inc....	\$18,924,451.88
Deduct: Cost of sales, including plant maintenance and repairs and depreciation of plant.....	17,621,833.55
Net income from sales .....	\$1,302,618.33
Other income, including profit on special contracts of the General Vehicle Co., Inc., and interest earned .....	405,013.44
Total income .....	\$1,707,631.77
Deduct: Interest on two year 6 per cent convertible gold notes	300,000.00
Depreciation in market value of investments and losses on investments sold .....	34,962.51
Federal excess profits and income taxes .....	306,799.39
Total deductions .....	\$641,761.90
Balance .....	\$1,065,869.87
Special reserve for contingencies .....	\$116,386.60
Net profit for year carried to balance sheet .....	\$949,483.27

#### To Drive 40 Marmons

INDIANAPOLIS, March 14—The first large driveway ever held by the Nordyke & Marmon Co. will leave here Sunday for New York. Forty cars will be in line and will go via Columbus, Pittsburgh and Philadelphia over the Lincoln Highway. Last year the New York agency drove 15 or 20 cars, but got most of what it wanted by rail. This winter it secured a few by rail but now has been compelled to resort to the driveway. Drivers are difficult to secure.

#### Marshall on Industrial Committee

WASHINGTON, March 12—In line with the general policy of the Secretary of War to keep thoroughly advised of the detail workings of the various departments of the Government and with the industrial conditions involved in the consummation of the various war programs, announcement is made of the appointment of a committee consisting of Snowden Marshall of New York, Edward Wells of the Babcock & Wilcox Co., and a third whose name will be announced later. This committee will make a broad survey of the Government's aeronautical program with particular relation to the industrial phases of the work.

## Sell 3000 Overlands in South America

### Argentine Sales Held Back by Labor Troubles and the Railroad Strike—Import Duties to Be Increased

NEW YORK CITY, March 8—Approximately 3000 Willys-Overland cars were marketed in the South American countries during the 1917 calendar year, according to Edward Rochette, South American representative of Willys-Overland, with headquarters in Buenos Aires, who has just completed a business trip in this country. Although Argentina has just harvested one of its best crops, as compared with the poor crop in 1916, the last automobile selling season, beginning in November and extending to the present, has generally been a disappointment to all Argentine dealers. The added buying value of the good crops has been offset by unsettled conditions due to labor troubles. There has been the additional problem of the relationship between Argentina and the Allies with regard to the purchase of the crop. The purchasing agreement was not settled until January, 1918, the middle of the selling season. Up to this point farmers did not know what they were going to realize from their crops and held back buying.

#### Railroad Strike Hurts Sales

The unfortunate railroad strike, which lasted more than 6 weeks, injured sales. It was not possible for distributors in Buenos Aires to drive automobiles overland to different parts of the country as it is possible in this country. Labor leaders would not allow specially hired chauffeurs to drive machines overland. It was possible only for the owner or his private chauffeur to do such work. Others attempting it were mobbed.

There was one bright side to the strike situation, namely, that sales increased in Buenos Aires so that business men could get out of the city to look after their affairs. Some of these men paid as much as \$160 to be driven from Buenos Aires to the port of Bahia Blanca, a distance of 375 miles.

#### Import Duties to Be Increased

Cable dispatches from Buenos Aires, according to Mr. Rochette, indicate that the import duty on automobiles and parts will soon be increased 20 per cent. Up to the present the import on automobiles has approximated 12 per cent and that on parts approximated 45 per cent. The increased custom duties will increase sales resistance.

Argentina has not been suffering severely from lack of shipping facilities, and ocean rates were not as high as they were 2 years ago. The majority of cars pay 67½c. per cu. ft. A few were imported at a maximum rate of \$1.15. Occasionally the rate was as high as 80 or 90c. per cu. ft. At present Willys-Overland is shipping cars via New Orleans, which costs approximately \$5 per car more than via New York.

The question of the 56-in. tread in Argentina is far from being a settled

factor, notwithstanding the ruling of American manufacturers that they would only supply this width of tread for South American countries. Road conditions in the Argentine camp or country have not improved in the last 2 years and the demand for the 60-in. tread is as great as ever. During the 1917 year Ford was generally supplying 60-in. treads, and so was Studebaker. They were apparently using up stocks of axles that were on hand previous to the agreement among American manufacturers. Overland is now obtaining what amounts to a 60-in. tread by use of a special design of wire wheel which places the tread of the tire 2 in. further out on each side. As the majority of American motor cars are sold in the country, the problem of the 60-in. tread is important.

A strong demand still exists throughout Argentina for magneto ignition, and Willys-Overland cars sold are so equipped. Studebaker is also providing a magneto. The demand for the magneto is due to the fact that, in country travel, cars frequently have to cross small streams, and the owner believes magnetos suffer less than batteries from the water.

Mr. Rochette is convinced that electric starting and lighting are essential and are wanted throughout South America. Troubles due to battery service are not retarding the sale of cars at present. Most of the battery service and repair work for Argentina is handled in Buenos Aires. P. A. Hardcastle, Willys-Overland distributor, who also has the agency for the U. S. L. batteries, has all repair work done at his depot.

#### Seven-Passenger Car Popular

The 7-passenger car continues to be the great seller in Argentina and Brazil. There is also a good demand for 5-passenger cars, but it is believed if every car offered for sale accommodated 7 passengers it would be in greater demand. Mr. Hardcastle at present has 120 dealers throughout Argentina, but these must not be thought of as dealers pursuing intensified selling methods like those of North American dealers. The Argentine dealer does not pay deposits on cars when they are ordered, but rather the distributor in Buenos Aires consigns the cars to them, and generally has to wait some time for his remittance after the cars are sold.

In the accessory field, American tire makers have the majority of the business, although such European tires as Michelin, Pirelli, Dunlop and the North British Clincher are selling well. The American trade is headed by Goodyear, followed by United States, Fisk, Goodrich, Firestone and Republic. Tire prices are considerably higher in Argentina than in the United States, a 34 x 4 casing retailing in Buenos Aires at \$40 U. S. A. currency. As yet there is small demand for cord types.

Gasoline is now retailing at 55 cents U. S. A. money, per standard gallon. Due to the activities of the Bowser Co., the curb-side gasoline pump, which was introduced into Buenos Aires 2 years ago, has been making good progress.

Mr. Rochette reports that retail sales in Rio de Janeiro, Brazil, have been increasing in the past year and that the general condition of the city as a selling market is improving. This is due to the fact that 2 to 5 years ago Rio dealers were heavily stocked with European cars, which they were compelled to sell on long time payments. Many of these payments are now completed and American cars are now taking the place of the European models. The selling field in Sao Paulo, which is a better Brazilian field than Rio, continues good. Sao Paulo is on the edge of the great coffee belt, a night's ride by railroad from Rio, and this city as well as the fertile coffee land is also good. On the other hand conditions in Rio are different in that the city is surrounded by a mountainous area, and all sales are practically limited to the city and its immediate suburbs.

In a few of the leading South American cities, such as Buenos Aires, Montevideo, Rio and Sao Paulo, there is a slightly increasing demand for the sedan type of car for city use. This type, however, is too heavy for the country roads, and has not met with any appreciable demand.

#### Boone Tire Condition Satisfactory

CHIPPEWA FALLS, WIS., March 11—The Boone Tire & Rubber Co. is in an altogether satisfactory financial condition, despite reports published in local newspapers to the contrary. These reports were circulated by a disgruntled employee, and are disproved by the financial statement of the company. On Jan. 1, 1918, total fixed and current assets amounted to \$259,275.18 as compared with total current liabilities of \$77,655.09. Since the first of the year the assets have been increased by the additional sale of \$50,000 of capital stock.

#### Illinois License Fee Increased

CHICAGO, March 9—Motor vehicle license fees in Illinois have been increased from 50 to 100 per cent for 1918, and a further increase will take place in 1920. License fee costs follow:

Vehicle	1917	1918	1920
Motor cycles.....	\$2.00	\$3.00	\$4.00
10 H.P.....	3.00	4.50	6.00
10-25 H.P.....	4.00	6.00	8.00
25-35 H.P.....	6.00	9.00	12.00
35-50 H.P.....	8.00	16.00	20.00
Over 50 H.P.....	10.00	20.00	25.00
Electric, under 2 tons..	5.00	10.00	12.00
Electric, over 2 tons..	10.00	20.00	25.00
Dealers .....	6.00	10.00	12.00

#### No Duty on War Supply Material

WASHINGTON, March 11—Raw materials, parts of equipment necessary to production of war supplies on which an import duty is now imposed will be admitted free during the war if an amendment offered by Senator Martin of Vir-



ginia to the deficiency appropriation bill is accepted. The amendment reads:

"During the present emergency, upon request made by the Secretary of War to the Secretary of the Treasury and under regulations to be prescribed by the Secretary of the Treasury, there may be imported into the United States without payment of duty thereon, raw materials, parts, or partly fabricated parts of equipment or finished equipment required to hasten the production of munitions or machinery of war or other necessary war supplies whenever such duty would otherwise be payable directly or indirectly from appropriations for support of the army."

#### Western Insurance Rates Changed

CHICAGO, March 9—New insurance rates and rules for motor cars on liability, property damage and collision policies, have been sent out to agents in the territory of the Western Underwriters' Conference, which includes the Central States. Hereafter there will be two policies offered for property damage, one giving the complete coverage without any deduction, for which a much higher rate will be charged than at present, and the other will be under a \$100 deductible form, with a lower rate than for the present \$25 deductible form.

The full coverage form, under the new ruling, does not have the \$200 fire loss exclusion nor the old road bed exclusion, but covers every legitimate collision loss. The old form used to exclude loss by fire up to \$200, and also exclude property damage caused by "collision with the road bed." There is no longer any differential collision rate between commercial cars and private passenger cars. Livery cars and other public cars, as well as demonstrators, will carry higher rates.

#### Washington Hangars for Liberty Planes

WASHINGTON, March 11—Hangars now being constructed in Potomac Park to accommodate two airplanes will house two Liberty airplanes, according to report. These airplanes, it is said, will make flights over Washington within the next few weeks to demonstrate their real ability.

#### U. S. Chamber of Commerce Meeting in April

WASHINGTON, March 8—More than 500,000 business men will be represented at the sixth annual meeting of the United States Chamber of Commerce, to be held in Chicago April 10, 11 and 12. The questions of financing the war, the railroad situation, centralized control of industry and the shipping problem will be discussed both from the point of view of filling the government's needs and that of causing a minimum disturbance in private industry.

#### Navy Agent Arrives in France

WASHINGTON, March 9—Lieutenant Commander Benj. Briscoe, United States Navy, has arrived in France, where he will have charge of specified construction for the navy.

## 4,500 British Trucks Run on Gas

### Only 4 Per Cent Is Supplied to Passenger Cars—Remainder for Business Purposes

LONDON, ENG., Feb. 14—At present, 4500 motor trucks are running on gas carried in large rubber gas bags, instead of using gasoline, and orders are on hand for gas containers for 2500 motor trucks which have not been able to obtain them up to this time. These figures indicate that gas will be used to a very large extent, not only because of its economy, but because the production of excess quantities of gas is inevitable from the process for the production of benzol from soft coal, which benzol will be then used as well as gasoline.

The production of gas is also certain because of coke manufacture, the coke being used in heavy commercial vehicles. This increased use of benzol and gas appeals to the motorist, in that it makes him independent of imported fuels, which is a consideration in days when ocean tonnage is at such a premium.

There has been some misunderstanding as to the use of gas, in that many people have concluded that it is being used by passenger cars to which the use of gasoline has been denied. The fact that only 4 per cent of the total deliveries of gas apparatus to date has been to owners of private cars indicates that the use of gas has been taken up by the business man for his motor trucks. Further orders of gas apparatus for passenger cars cannot be accepted, as the use of gas for cars is practically subject to the same restrictions as gasoline.

It is estimated that the saving of gasoline for business vehicles alone amounts to 3,000,000 Imperial gallons a year due to the use of gas.

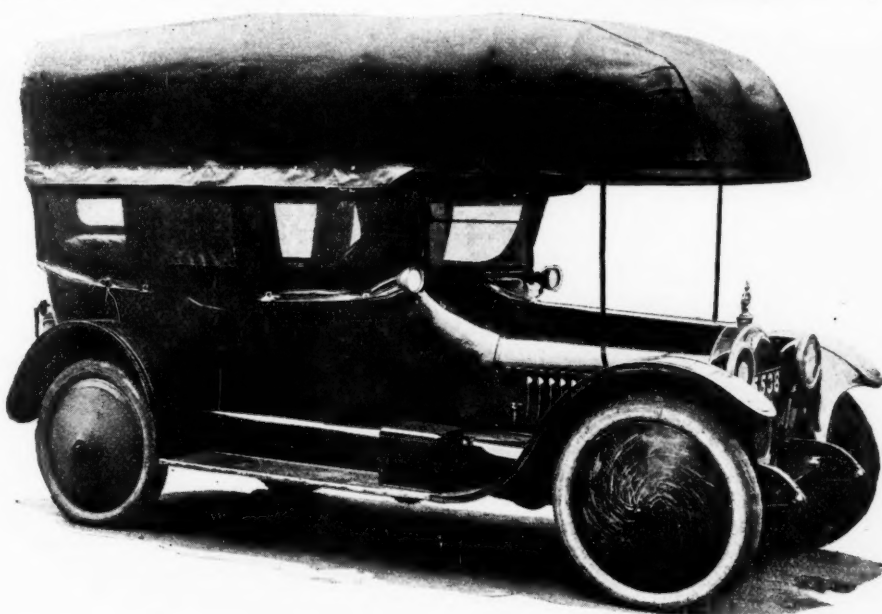
Recently a gas traction committee was formed by the government to consider what further rules are necessary with regard to gas as a fuel. This committee will issue a report in a few weeks containing recommendations for the use of gas and flexible containers at atmospheric pressure, and will also indicate the limits of approved use under limited pressure in semi-rigid containers. The committee will also outline the necessary restrictions for the use of compressed gas at high pressures after the war.

#### Purchasing Agents Form Toledo Branch

TOLEDO, March 12—A branch of the National Assn. of Purchasing Agents has been established here as a result of an organization meeting and dinner. The charter of membership was signed up at the first meeting, and it is expected that this will be increased to 150 representing the largest industries in the city. F. J. Solon of the Owens Bottle Machine Co. is president. Other officers are: First vice-president, Mark Kuehn of the National Malleable Castings Co.; second vice-president, W. L. Flaherty of the Toledo Scale Co.; treasurer, R. H. Bradley of the Walding, Kinnan & Marvin Co., and secretary, R. A. Luedtke of the National Malleable Castings Co. Meetings of the new organization will be held twice a month. The national association has branches in the larger cities.

#### Flyers Study Ignition

CHICAGO, March 9—Several aviators are being sent to Chicago from the government aviation school to study magnetos. Squads of 8 student aviators are spending 2 weeks in intensive study at the Chicago branch of the Bosch Magneto Co. A third squad from the aviation school at San Antonio, Texas, is just completing its course, and it is expected that squads from the other flying camps will also receive this training.



British passenger cars operating with gas as a fuel have a large gas container bag attached to the top

## Standard Gearing for Tractors

Minneapolis Section of S. A. E.  
Told of Necessity for This  
in Farm Work

MINNEAPOLIS, March 11—Laying emphasis upon the tremendous strain under which the gearing in a farm tractor is required to do its work, A. W. Scarratt, of the Minneapolis Steel & Machinery Co., stated in a paper read before the Minneapolis section of the Society of Engineers that a tractor transmission must do the work in one year that a passenger car transmission would do in 20 years. The title of the paper was Tractor Gear Teeth and Materials.

Mr. Scarratt deplored the lack of real engineering data as to gear teeth which would aid in conserving valuable material. Materials for gears are of a wide range, each of which has some advantage, and each tooth shape has some favorable point. In choosing a material it must have proper strength for the loads, proper hardness for service and proper dynamic qualities against impact and fatigue, and it is on the last point that there is a lack of information as well as on the strength of gear teeth.

The speaker suggested experiments for data on the relation of surface pressures and the degree of surface hardness necessary to produce a given service. Because of the various shapes of teeth no common rule can be employed to figure their strength. The most commonly used formula for these particular types of teeth is the Wilfred Lewis, but several large manufacturers do not adhere to the Lewis recommendations for allowable stress, because, considering the ability of chrome vanadium steel to resist impact forces as against cast iron, for instance, it is foolish to class them accordingly.

Besides increasing the pressure angle when considering strength of gear teeth another way of increasing load carrying capacity is to shorten the tooth. There should be a standard stub 20-deg. tooth which does not have definitely fixed proportions based on the pitch. The Fellows system fails in some instances, necessitating a larger pitch. In the present system there is no convenient or accurate formula for figuring the strength of these stub teeth. The speaker said there is room for great improvement and enlightenment through research work.

F. McDonough discussed a new form of hydro-automotive transmission as patented by Joseph Rosche, a device for the commercial realization of hydraulic transmission as applied to motor vehicles. It is a step toward eliminating weaknesses in principle which are native to the present system generally utilized on automobiles and trucks, and which is saved from failure by finest materials, workmanship and detailed engineering design.

Solution of the problem of an efficient and flexible transmission for motor-

driven vehicles seems to have been reached in the perfection of a hydraulic transmission. Driving and driven cylinder pistons are stationary when both are rotating at the same speed. It has no revolving surfaces coming in contact, all cylinders being integral in one casting.

## Motor Products Earnings \$537,527 in First Year

DETROIT, March 14—The Motor Products Corp., Detroit, made during 1917 net profits of \$537,527, of which \$233,333 has already been paid in dividends. This is the end of the first full fiscal year ending Dec. 31, 1917. The corporation has no liabilities except its current monthly accounts. Assets in the nature of cash, sound accounts receivable and land contracts amount to \$2,919,967.

The corporation's sales for the year have amounted to \$9,633,082, which is an increase over the previous period of 48.6 per cent. This increase does not include any Government or war orders and covers a term in which the corporation's affairs were consolidated by the bringing of four of its manufacturing plants into the newly acquired Lozier plant.

No provision has been made in the above earnings for federal taxes, and it is estimated that they will be \$80,000 or \$100,000. Government business for the future has been obtained to the amount of \$5,500,000. Orders have also been obtained for new business to the amount of \$2,000,000.

The balance sheet shows assets of \$5,049,072, of which \$2,725,390 are current and \$2,520,720 are fixed. The company has a main factory at Detroit and branches at Ann Arbor, Mich., and Wal-kerville, Ont.

## How One Maker Gets Freight Cars

DETROIT, March 9—As a corollary to the freight car shortage and the problems which it has brought about, it is reported that one Detroit manufacturer of cars has been given permission by the government to use a certain number of freight cars with the understanding that they are to be sent into the grain belt. Thus the empties can be used for sending foodstuffs back East.

## Car Equipment Company Bankrupt

DETROIT, March 9—The Universal Car Equipment Co., maker of body and top equipment, such as fenders, tire holders, radiators, shields, etc., has been adjudicated bankrupt, and its equipment will be sold at auction on March 11 in Detroit. Creditors have been notified that they should be prepared to close up their business with the bankrupt corporation on March 12. The property for sale at auction is valued at \$2,953.50. The sale has been called by Lee E. Joslyn, referee in bankruptcy.

## Bureau at Capital Proposed

But Plans of N. A. C. C. and  
M. A. M. A. Are Immature  
Yet—Production Census

WASHINGTON, March 12—At this time and until the meeting of the Motor & Accessory Manufacturers' Association this coming Friday, plans both of Hugh Chalmers and A. W. Copland, members of the Automobile Industries Committee, recently dissolved, are uncertain. Mr. Chalmers has a number of matters to be cleared up that concern the committee, and Mr. Copland does not yet know whether his committee will be continued with him in charge or not.

Reports have it that the committee will in all likelihood continue to represent the M. A. M. A. here. Mr. Chalmers stated to-day that he will endeavor to organize a sort of clearing house and bureau of information for the automobile and truck manufacturers.

As the offices of both organizations are now located jointly in two buildings, the Ouray Building and the Second National Bank Building, action will have to be taken at the coming meeting to decide which offices will be occupied by each.

The National Automobile Chamber of Commerce is sending to each manufacturer of automobiles a blank statement to be filled in and returned to the National Automobile Chamber of Commerce, showing the number of cars produced since the beginning of the fiscal year, materials on hand, commitments, and what production would be without curtailment and what it will be with a 30 per cent curtailment arranged between the Fuel Committee of the industry and the Fuel Administration.

The Chamber will file these reports with the War Industries Board, which, where they are not sworn to, will retain the right to order special investigations of any company or companies.

## Jones Prices Increased

WICHITA, KAN., March 11—The factory prices of Jones passenger cars will be increased on March 15 as follows:

Model	New Price	Old Price	In-crease
7-passenger touring 26B— (Lewis engine) .....	\$1,775	\$1,675	\$100
5-passenger roadster 26A— (Lewis engine) .....	1,775	1,675	100
4-passenger sport type 26C —(Lewis engine) .....	1,775	1,675	100
7-passenger touring 27A— (Continental engine) ...	1,875	1,675	200
4-passenger roadster 27A— (Continental engine) ...	1,875	1,675	200
4-passenger sport type 27C —(Continental engine) ..	1,875	1,675	200

## Oakland Models Increased \$60

PONTIAC, MICH., March 12—An increase of \$60 in the price of all Oakland models went into effect March 1. The prices follow:

Model	New Price	Old Price
Town car .....	\$2,000	\$1,940
Unit body sedan .....	1,550	1,490
Convertible sedan .....	1,250	1,190
Roadster coupe .....	1,210	1,150
5-passenger touring .....	1,050	990
3-passenger roadster ..	1,050	990



## Transport Committee Urges Extensive Work

WASHINGTON, March 13—Indications point to an unprecedented development of highway traffic in 1918, as a result of the nation-wide effort that will be made to keep roads open every day in the year. Last year storms frequently killed travel over urgently needed roads, isolated many farms and struck a severe blow at the nation's war preparations. Short-haul freight which could not be handled by already over-taxed railroads, but which could have been diverted to clear highways, was piled up in immense quantities.

The foregoing facts are given by the Highway Transport Committee as a few of the arguments why it is a patriotic duty to keep all roads open at this time. State, municipal, county and township organizations should be concentrating on plans to safeguard traffic against all of the interruptions that were met last winter. Sufficient machinery and horses are on hand to do this, the main difficulty being to get a quick start.

### 10 Per Cent Dividend Paid by Alter Motor

DETROIT, March 11—The Detroit Trust Co., trustee for the Alter Motor Car Co., Plymouth, Mich., is distributing an initial dividend of 10 per cent to creditors, realized on the sale of the property. Liabilities were \$25,000, and it is expected the creditors will receive not more than 25 per cent.

### Demand for Automobile Body Lumber

ST. LOUIS, March 13—Hardwood lumber manufacturers here, who sell largely to automobile body-builders, say that more orders are being received now than for several months past. Large buyers

are convinced that sap gum will not answer for body building, and that manufacturers are returning to ash, and to maple for cheaper bodies. Prices of maple and thick ash have been advanced, the former because of an insufficient supply, and the latter as a result of the heavy use in airplanes and vehicles. Automobile body ash, less than 2-in. in thickness, is quoted at \$80 for first and seconds, and \$64 for No. 1, as compared with \$58 and \$35 a year ago.

### Liberty Planes En Route to Washington

LAKE CHARLES, LA., March 13—Two Liberty airplanes have been shipped from here and are en route to Washington, where they will receive flying tests.

### 2200 Scripps on Order

DETROIT, March 12—The Scripps-Booth Co. has on its books unfilled orders for 2200 cars of its new model. The company puts out 20 cars a day, half of which are of the old four-cylinder model.

### Kelly-Springfield Reduces Stock

CLEVELAND, March 13—At the annual meeting of the Kelly-Springfield Tire Co. it was voted to reduce the 6 per cent cumulative first preferred stock to the extent of \$248,900 in accordance with the plan described in a recent number of AUTOMOTIVE INDUSTRIES. The retiring directors of the company were re-elected at the meeting.

### Jacobson Machine Now Warren Products

WARREN, PA., March 13—The Jacobson Machine Mfg. Co. will hereafter be styled Warren Machine Products Co. Formerly the company concentrated on the manufacture of gas engines, but this has become a minor activity, and the style was changed so that it would suggest the main products.

## Plan Tractor Demonstration in Vicinity of Wilmington

DOVER, DEL., March 13—The Kent County Farm Bureau, the official link between the Government and the farmers of the central county of the State, has arranged for a tractor demonstration to take place in this vicinity for 3 days during the week of April 15. It is hoped that this will attract not only Kent County farmers, but those in the other two counties of the State. Demonstrations in plowing, fitting and preparing the land will take place each afternoon, the mornings being allowed for examining the machines. An invitation has been extended to all tractor manufacturers with agencies here to take part in the demonstration. Seven have responded and each, it is expected, will exhibit several different types of machine.

### International Harvester Tractor Schools

GRAND RAPIDS, MICH., March 13—The International Harvester Co. of America has established three tractor schools in this state to educate operators in handling tractors more efficiently. More than 90 per cent of tractor troubles are caused by lack of knowledge on the part of the operator and can be avoided if the operator learns the general construction of an internal combustion engine.

### Army Laundry on Trailer

WASHINGTON, March 11—The first portable army laundry built to accompany an army and wash clothes for soldiers in the field arrived here yesterday. The plant, invented by J. F. Broadbent, consists of a steam tractor and standard laundry equipment mounted on a trailer.

## Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	51	54	—1
*J. I. Case T. M. Co. pfd.	84	85	—1
Chalmers Motor Co. com.	4	6	—2
Chalmers Motor Co. pfd.	30	40	—
*Chandler Motor Co.	87	88½	—½
Chevrolet Motor Co.	120	123	+3
*Fisher Body Corp. com.	30	35	+2
*Fisher Body Corp. pfd.	80	87	—
Fisk Rubber Co. com.	50	53	—
Fisk Rubber Co. 1st pfd.	98	103	—
Fisk Rubber Co. 2nd pfd.	70	75	—
Firestone Tire & Rubber Co. com.	96	98	—
Firestone Tire & Rubber Co. pfd.	98	99	—1
*General Motors Co. com.	124½	126	+8
*General Motors Co. pfd.	81	83	+2
*B. F. Goodrich Co. com.	44	45	—½
*B. F. Goodrich Co. pfd.	94	100	—
Goodyear Tire & Rubber Co. com.	139	142	+3
Goodyear Tire & Rubber Co. pfd.	99	100	—
Grant Motor Car Corp.	2	3	—
Hupp Motor Car Corp. com.	3	3½	+ ¼
Hupp Motor Car Corp. pfd.	78	83	—
International Motor Co. com.	16	20	+1
International Motor Co. 1st pfd.	40	60	+15
International Motor Co. 2nd pfd.	12	22	+2
*Kelly-Springfield Tire Co. com.	45	46	—1
*Kelly-Springfield Tire Co. 1st pfd.	75	85	—
*Lee Rubber & Tire Corp.	14	16	—
*Maxwell Motor Co., Inc., com.	29	30	+1
*Maxwell Motor Co., Inc., 1st pfd.	58	61	—2
*Maxwell Motor Co., Inc., 2nd pfd.	22	24	—
Miller Rubber Co. com.	133	137	—
Miller Rubber Co. pfd.	94	97	—1
Packard Motor Car Co. com.	95	100	—2
Packard Motor Car Co. pfd.	90	93	—2
Paige-Detroit Motor Car Co.	18	20	—1
Peerless Truck & Motor Corp.	16½	17½	—1
Portage Rubber Co. com.	110	112	—1
Reo Motor Car Co.	17	19	—
*Saxon Motor Car Corp.	8½	10	—½

	Bid	Asked	Net Ch'ge
Standard Motor Construction Co.	11	12	—1
Standard Parts	71	74	—4½
*Stewart-Warner Speed. Corp.	55	56	—½
*Studebaker Corp. com.	46	47	—1½
*Studebaker Corp. pfd.	91	94	—2
Swinehart Tire & Rubber Co.	..	35	—
United Motors Corp.	26½	27	—1½
*U. S. Rubber Co. com.	55½	57	—1½
*U. S. Rubber Co. pfd.	100	102	—1
*White Motor Co.	44	46	—2½
*Willys-Overland Co. com.	18	19	—
*Willys-Overland Co. pfd.	80	82	—

\*At close March 9, 1918. Listed N. Y. Stock Exchange.

### OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE ACTIVE STOCKS

	Bid	Asked	Net change
Auto Body Co.	7	..	..
Bower Roller Bearing Co.	18	18½	..
Chevrolet Motor Co.	120	123	+1
Commerce Motor Car Co.	10½	11	+3½
Continental Motor Co. com.	5½	6½	+ ¼
Continental Motor Co. pfd.	..	..	..
Edmunds & Jones com.	..	..	..
Edmunds & Jones pfd.	..	..	..
Ford Motor Co. of Canada	212	..	—4
Hall Lamp Co.	13½	..	..
Michigan Stamping Co. com.	12¾	14½	— ¼
Motor Products	..	..	..
Packard Motor Car Co. com.	93	..	..
Packard Motor Car Co. pfd.	..	92	..
Paige-Detroit Motor Car Co.	18½	19½	—1
Prudden Wheel Co.	..	14½	..
Reo Motor Car Co.	18	18½	+ ¼

### INACTIVE STOCKS

	Bid	Asked	Net change
Atlas Drop Forge	..	27½	..
Kelsey Wheel Co.	86	93	+3
Regal Motor Car Co.	..	26½	..

## Men of the Industry

*Changes in Personnel and  
Position*

### Elgin Motor Elects Rieman as President

CHICAGO, March 11—C. S. Rieman has been elected president and general manager of the Elgin Motor Car Corp., which he founded 2 years ago. He has been vice-president and general manager of the company since its organization.

Donald W. Whittaker has been appointed advertising manager of the Aca-son Motor Truck Co., Detroit. Formerly he was assistant advertising manager of the Federal Motor Truck Co. and sales manager of the Detroit Truck Co.

H. J. Montgomery, superintendent of production for the Advance-Rumely Co., Laporte, Ind., has resigned.

H. O. Bernhardt, formerly production manager of the Harroun Motors Corp., Wayne, Mich., has received the commission of major in the Ordnance Department. He will be connected with the central bureau supervision section.

Joseph W. Gardham, formerly technical representative of the Chalmers Motor Co., is now in charge of tests of motor trucks for the Militor Corp., Jersey City, N. J.

E. R. Jacobi has resigned as chief inspector of the Reo Motor Car Co. and has joined the Mitchell Motors Co., Inc., Racine, Wis.

N. W. Barton, formerly manager of the Chicago branch and assistant general sales manager of the Olds Motor Works, has been promoted to the position of eastern division sales manager. His headquarters will be in Lansing.

G. D. Yeager has been elected president and general manager of the Wagner Axle Co., Anderson, Ind., to succeed H. P. Harding, who resigned.

G. A. Freeman has resigned as vice-president of the J. C. Wilson Co., Detroit, and has joined the airplane body division of the C. R. Wilson Body Co., Bay City, Mich.

Andrew Lehr, formerly with the Studebaker Corp. of America, has been elected vice-president of the J. C. Wilson Co., Detroit.

Horace T. Thomas, chief engineer of the Reo Motor Car Co. since its organization, has been appointed a member of the committee which will design and perfect the new standardized  $\frac{3}{4}$ -ton gov-

ernment truck. He will work at Washington, and take his place among the "dollar-a-year" men. The Reo company has ordered that his title and salary be continued through the war.

Clarence S. Walker has been appointed patent counsel of the Wire Wheel Corp. of America, Buffalo. He formerly held a similar position with the Packard Motor Car Co.

G. G. Germaine has been appointed district representative in New England for the Standard Parts Co., with headquarters in Boston. He was formerly associated with the Kawneer Mfg. Co.

F. J. Bury, service expert of the Packard Motor Car Co., Detroit, who has been connected with the St. Louis Packard company for some time, has resumed work at the plant.

C. W. Inches has resigned as assistant purchasing agent of the Briscoe Motor Corp., Jackson, Mich., to become purchasing agent of the Trego Motors Corp., New Haven, Conn.

W. Whitney Slaght has been appointed experimental engineer of the Pierce-Arrow Co., Buffalo.

Raymond V. Morris has been appointed general manager of the Savage Tire Co., San Diego, Cal. He was formerly connected with the Curtiss Aeroplane & Motors Corp.

N. J. Fitch has been appointed manager of the Detroit branch of the Bearing Service Co., succeeding E. G. Volker, who has been promoted to the position of manager of the New York branch.

E. W. Dobson has been appointed factory manager of the Standard Motor Truck Co., Detroit. He was formerly in charge of the truck department of the Packard Motor Car Co. and later was with the Continental Motor Co. and the Hercules Motor Co.

H. L. Innes, factory manager of the Chevrolet Motor Co. for the past year, has been transferred to General Motors headquarters in New York. Thomas Houghton, formerly with the Durant-Dort Co., the Dominion Carriage Co. of Toronto and the Tarrytown plant of the Chevrolet, will succeed him in the Chevrolet plant at Flint.

Frank A. Hayes, formerly engineer with the Willys-Overland Co., Toledo, has been appointed chief engineer of the Willys-Overland, Ltd., Toronto, Ont.

Henry C. Limbach, former production manager of the Zenith Carburetor Co., is now equipment engineer of the Strong, Carlisle & Hammond Co., Detroit.

E. R. Parker, formerly vice-president of the J. R. Holland Automobile Co., has been appointed southwestern district sales manager of the Saxon Motor Car Co., Detroit.

## New Companies Formed

*Latest additions to ranks of  
Automotive Industries*

### Truss Type Inner Tubes Coming from Cincinnati

CINCINNATI, March 9—The Ross-Lambert Rubber Co. has been organized, with an authorized capital of \$3,000,000, to manufacture inner tubes of a new model styled the truss type, and other rubber accessories. The company is negotiating for a site near Cincinnati, and the directors hope to have a plant in operation in 2 months. It is reported that a large order from the British Government has been received. Officers are: Charles E. Ross, Columbus, president and general manager; C. H. Lambert, Hartwell, Ohio, vice-president and secretary, and A. B. Lambert, treasurer.

### Automotive Engineering Corp. Formed

BUFFALO, March 12—The Automotive Engineering Corp. has been incorporated here with a capital stock of \$125,000 to manufacture carburetors and engines. H. R. Richards, E. McM. Mills and M. C. Spratt are the incorporators, and will have offices for the present in the Fidelity Trust Building.

### To Make Converters for Fords

YOUNGSTOWN, O., March 11—The Lauton Truck Co. has been organized here by A. W. Lau to make converters for Fords and other light cars, and Cadillacs to make them into 1 and 2-ton trucks. The company plans a production of from 7500 to 10,000 units the first year. The first shipment of these was sent East last week. Associated with A. W. Lau are W. R. Kirby, of the W. B. Pollock Co., and J. W. Riddle. M. D. Davidson will be sales manager.

### Johnson Wheel Co. in South Bend

SOUTH BEND, IND., March 9—The Johnson Motor Wheel Co., recently organized with \$100,000 capital, will have its plant and principal office here. The company will manufacture gas engines.

### Johnstone Tire Ready for Production

SOUTH BEND, IND., March 9—The Johnstone Tire & Rubber Co., organized under the laws of this state, has almost finished equipping its building at Laporte, Ind., and will begin the manufacture of semi-solid and solid truck tires before the end of the month. C. W. Mussey, formerly treasurer of the company, was elected president. E. G. Bird was re-elected secretary and B. R. Blackwelder vice-president. A. A. Peterson will be factory manager and superintendent.



## A. A. A. Control for Racing

### Contest Board Has Again Taken Hold of Competitions—Status Same as Last November

NEW YORK, March 9—The Contest Board of the American Automobile Association has again taken hold of motor-car contests, and will immediately resume its control of contests, as it has done for years past.

In November the Contest Board decided not to sanction any more contests during the period of war exigency, due to the insistent demands of the government for skilled mechanics well qualified as motor experts for aviation and other services. The action at that time was taken because of an official letter from the government on the subject.

It has developed that the government department has not the power to stop the sport, as was anticipated, although such power may be forthcoming in the future. It was rumored that gasoline would not be allowed for racing purposes, but the Fuel Administration has no power to enforce any such rule were it promulgated. It was also rumored that the Railroad Administrator would not allow racing motor cars to be shipped on railroads, but even that action would not stop racing, as the cars could be driven overland from one speedway to another.

The present action of the Contest Board in again taking up the control and sanctioning of races came from race promoters, who asked for such protection. Some of the leading promoters soon realized how valuable and necessary it is to have an impartial controlling body such as the Contest Board. It is a great protection to the promoter both as regards his arrangements with drivers and with entrants. As a result of this, as well as because of the Washington situation, it was voted at a meeting of the Contest Board, held to-day, to immediately resume control. This means that everything is back just where it was previous to the action taken last November, when it was decided not to sanction contests during the war period.

Already a complete schedule of races for several speedways has been prepared by the speedway interests, and these will be sanctioned and handled under the regular rules. The Contest Board offices have been reopened in the Bankers Trust Building, corner of Fifth Avenue and Forty-second Street, and Chairman Richard Kennerdell is in charge, with the same board assisting him as formerly.

William L. Wellman, race promoter, has a complete schedule of races, extending from early in May until October, and embracing such speedways as Sheepshead Bay, Chicago, Uniontown, Providence, Cincinnati, and perhaps Philadelphia. The schedule is not complete, but embraces the following definite dates:

Uniontown, Pa. ....	May 16
New York .....	May 30
Uniontown .....	Aug. 3
Providence .....	Aug. 17
New York .....	Aug. 17
Uniontown .....	Sept. 2
New York .....	Sept. 21

Other speedways with which arrangements are not yet completed are expected to take in other important dates not included in this schedule.

There seems to be nothing definite with regard to the Philadelphia speedway, and it is questionable if it will be completed in time for any racing. Lumber that was intended for the construction of it has been taken by the government, and to date none of the lumber construction work has been started. The necessary grading for the construction work has largely been completed.

The three big meetings selected for the summer are May 30, Aug. 17 and Sept. 21, all in New York. The Harkness cup race on Sept. 21 will be the closing event of the year. New York also has the Decoration Day race, which heretofore has gone to Indianapolis.

There will not be any racing on the pioneer Indianapolis speedway, as Carl G. Fisher, president, as well as James Allison, F. H. Wheeler and A. C. Newby, the stockholders of it, announced last year that they were out of racing for the period of the war, and that none of their racing cars would enter in any contests. The only contests Indianapolis would stage would be benefit races, where all of the receipts would go for war benefits.

### Sutphen President of Engine and Boat Association

NEW YORK, March 11—Henry R. Sutphen, president of the Electric Boat Co., was elected president of the National Assn. of Engine and Boat Manufacturers at the March meeting of the executive committee. He will succeed John J. Amory, who had been president of the association since its organization in 1904. The following officers were also chosen for 1918: John J. Amory, president of the Gas Engine & Power Co. and Chas. L. Seabury, Consolidated, first vice-president; Percy C. Jones, of the S. M. Jones Co., Toledo, second vice-president; Charles A. Criqui, president of the Sterling Engine Co., Buffalo, third vice-president; James Craig, owner of the James Craig Engine & Machine Works, treasurer, and Ira Hand, secretary.

### Dearborn Urged as Residence Section

DEARBORN, MICH., March 12—Members of the Board of Commerce here are urging Ford tractor employees to build their homes in Dearborn instead of commuting from Detroit and points in this vicinity. The plant of Henry Ford & Son is constantly employing an additional number of men and its assured permanency is given as the main reason for urging employees to reside in this vicinity. The village of Dearborn is growing rapidly and is becoming a permanent industrial center.

## Tractor Competition for England

### Food Production Department Plans Sectional and National Contests

LONDON, ENGLAND, Feb. 15—A comprehensive schedule of tractor-plowing competitions which are largely sporting competitive affairs has been started in England. This is the result of an experiment tried in several districts by the Food Production Department to increase the acreage plowed by tractors to the maximum.

The scheme as now outlined for the entire country consists of a series of sectional and national competitions as follows: First for units; second for counties; third for the whole of England and Wales.

Each competition will continue for 1 month. The first competition begins Feb. 9, the second on March 9, and the third on April 6.

This schedule means that there will be three monthly competitions for each unit. There will be three for each county and three national ones. Additional men and machines will be admitted to the competition so that they may be added to the nation's agricultural tractor power during the spring plowing season.

The details of this threefold competition are:

1. For each unit—A distinctive flag to be carried on the tractor will be awarded to the tractor team in each unit which plows the greatest number of acres during each period of 4 weeks. This flag will be presented each month by the tractor representative of the county.

2. For each county—A championship flag will be awarded to the tractor team in each county which plows the greatest number of acres during each period of 4 weeks. A distinctive badge will also be worn by each member of the winning team. The flag and badges will be presented each month by the chairman of the county executive committee.

3. For England and Wales—A championship shield to be carried on the tractor will be awarded to the tractor team which plows the greatest number of acres in England and Wales during each period of 4 weeks. A small silver replica of this shield will also be given to each member of the winning team. The shield and replicas will be presented personally by the Director-General to the winning team, which will be invited to London for the purposes of the presentation.

Each trophy will be held for 4 weeks only, unless it is won again by the same team.

The complete scheme of competition not only awards those doing the most plowing but gives a national significance to the movement which results in increased plowing at a time when a national stimulant is imperative.

## Commerce Motor Car Co. Ready to Start Production

DETROIT, March 11—The Commerce Motor Car Co. will start production immediately on its \$2,000,000 government contract for 1-ton trucks. All material required has been purchased or contracted for at prices which insure a satisfactory profit. The directors have authorized the sale of \$100,000 of treasury stock at \$10 par, and one of these will be offered to each shareholder for each three held by him. The entire amount has been underwritten by Walter E. Parker, president of the company.

## Assembling Plant for Continental Motors

MUSKEGON, MICH., March 9—The Continental Motors Corp. is erecting a new building for assembling and block testing, which will be ready May 1. The Detroit plant reports an increase of 10 per cent in production during the last 2 weeks.

## Eagle Tractors Shipped to Italy

APPLETON, WIS., March 9—The Eagle Mfg. Co. last week made its first shipment of one carload of farm tractors to Italy on a large order from the Italian Government. The company is now finishing its new factory, which will be devoted exclusively to tractor manufacture. The original plant will be used for gas engines and other farm machinery.

## Bearings Service Co. to Move

DETROIT, March 9—The Bearings Service Co. will move soon into new and larger offices at Cass and Willis Avenues. The Detroit service branch of the company will be located in the same building.

## Westinghouse to Sell Frankel Connectors

PITTSBURGH, March 13—The Westinghouse Electric & Mfg. Co. has obtained the exclusive sales agency for all of the United States for Frankel solderless connectors, used for joining wires and cables. The Frankel Connector Co. has increased its facilities to care for the new business which will be obtained through the Westinghouse sales organization. The latter will also distribute Frankel testing clips.

## Cleveland Westinghouse Branch Moves

CLEVELAND, March 11—The district sales office of the Westinghouse Electric & Mfg. Co. here is now located in new quarters at 1900 Euclid Avenue.

## Liberty Drive Outboard Motor Marketed

DETROIT, March 13—The Caille Perfection Motor Co. is putting on the market a new little outboard motor for rowboats. It will be called "Liberty Drive," and will retail for \$48. Power is transmitted direct from the crankshaft to the engine, and the latter is mounted on a

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

swivel so that the boat can pass over an obstruction without causing damage to the propeller blades.

## Canadian Electric to Sell Defender Lock

DETROIT, March 11—The Canadian General Electric Co. has been appointed sole distributor of Defender Auto-Lock Co. products in Canada. On April 1 the retail price of the Defender auto-lock will be raised to \$4 in the United States and \$5 in Canada.

## Hotz Foundry to Double Production

FREMONT, OHIO, March 9—The Hotz Foundry & Mfg. Co. has erected an addition to its factory and installed extra machinery and equipment. Present production will be doubled.

## 90 Factories Making Liberty Truck Parts

WASHINGTON, March 12—Ninety factories are working to capacity on the standardized parts for Liberty trucks, according to reports received this week by the motor transport division of the War Department. The entire schedule will have been completed before Aug. 1.

## Capital Increase

DETROIT, March 5—The Acason Motor Truck Co. has increased its capital stock from \$50,000 to \$200,000.

## Dividends Declared

PHILADELPHIA, March 9—The Electric Storage Battery Co. has declared a dividend of \$1 a share on common and preferred stock, payable April 1 to stockholders of record March 18.

TOLEDO, March 9—The Willys-Overland Co. has declared a regular quarterly dividend of \$1.75 a share on preferred stock, payable April 1 to stock of record March 20.

The International Harvester Co. of New Jersey has declared a regular quarterly dividend of 1 1/4 per cent on the common stock, payable April 15 to stock of record March 25. Prior to this time the stock has been on a 5 per cent per annum basis.

## Paige Ultimatum to Signal

DETROIT, March 14—The Paige-Detroit Motor Car Co. has sent the Signal Motor Truck Co. an ultimatum, asking for an immediate answer on its offer to purchase the Signal plant. A reply is expected before Saturday.

## New Engine Made By Golden, Belknap & Swartz

DETROIT, March 13—Golden, Belknap & Swartz Co. is working on a new heavy duty type engine for trucks and tractors. It is expected that the model will be ready within two weeks. The cylinders are cast singly and have overhead valves, and the engine has the forced feed oil system. The retail price will be approximately \$300. The company expects to produce 5000 of the old model engines during the balance of the year.

## New York Office for Bourne

NEW YORK, March 12—The Bourne Magnetic Truck Co. has removed its factory and offices to Fifth Avenue and 142d Street, New York.

## Lozier Making 5 Cars Daily

DETROIT, March 14—The Lozier Motor Car Co. is still making cars on order, and production, according to reports, is five a day. The company has orders for 6 months.

## Jenkins Spring Offices Moved

ST. LOUIS, March 10—The general offices of the Jenkins Vulcan Spring Co. were moved from here to Richmond, Ind.

## Lawson Aircraft to Move

GREEN BAY, WIS., March 12—The plant of the Lawson Aircraft Corp. will in all probability be moved from here to Milwaukee. This was practically decided at a conference held in Milwaukee last week between representatives of banks, the Assn. of Commerce, the County Council of Defense and officers of the company. The Lawson company was organized 8 months ago, and recently moved into a new plant. This second change of location is necessitated by need for greater facilities and capital.

## D. W. Burke Buys Auto Electric Service

DETROIT, March 11—D. W. Burke has bought out and will operate the Auto Electric Service Corp., the official representative and service station for the Bijur, Auto-Lite, Dyneto, Westinghouse, Eclipse, Bendix, Tillotson Carbureter, Heinze-Springfield Ford Starter, Atwater-Kent, Berling, Connecticut, K-W ignition, Philbrin and Norma Bearing companies. Burke was formerly superintendent of automobile service of the Westinghouse Electric & Mfg. Co., Pittsburgh, and president of the Automotive Equipment Service Assn.

## Must File Bijur Claims April 15

NEW YORK, March 13—The receivers of the Bijur Motor Lighting Co. have given notice to all creditors of the company to assert their claims on or before April 15 in written form with proper verification. These must be filed with the receivers at the office of White & Case, 14 Wall Street.



# Industrial Review of the Week

A Summary of Major Developments in Other Fields

## Good Weather Eases

### General Coal Situation

Prevailing good weather has brought about a general easing up of the coal situation. The worst of the domestic distress is now over, and there is practically no suffering. New England, however, is still facing the problem of procuring an adequate coal supply—a problem that will not be solved till more ships are pressed into service. The shipping now available totals about 216,000 tons, as against the 351,000 tons considered necessary to meet the normal needs of this territory.

Though showing progressive improvement from week to week, the supply of cars to the mines is still not what it should be, and operators are unable to produce at maximum capacity. The bituminous mines in the central Pennsylvania district are the greatest sufferers from this lack of cars, the miners in that region working only part time. The loaded coal cars that figured in the recent rail congestion are now being returned from tidewater, and the near future should show a decided increase in the number of empties sent to the mines.

### Anthracite Deliveries Improve

Deliveries of anthracite by rail continue to pick up, though river shipments are little better than the February average, and receipts at tidewater are about normal. There is an active demand for steam sizes, with no free coal to be had from the large operators. The western markets are insistent in their plea for every pound of hard coal, as the government has intimated that after April 1 these markets will be asked to use bituminous coal from nearby regions.

Owing principally to the shortage of cars, the supply of bituminous coal continues to be unequal to the demand. True, there is a slight increase in production over previous weeks, but every ton is being quickly swallowed by a hungry market. Dealers are unable to accumulate reserve stocks as in former years, and it is hard to say when the shortage in soft coal will be overcome.

### Plans for Distribution

Much speculation exists regarding the many plans for zoning and distribution. The government's new price schedule is also awaited anxiously by the operators; and as for the dealers, they are marking time and wondering what will be in store for them after April 1, the government having shown that it is actually in control of both the wholesale and retail branches of the business.

There is practically no contracting for the new year, which begins April 1. Consumers, of course, are eager to provide for their next winter's requirements, but government regulations are against con-

## A New Service

Herewith AUTOMOTIVE INDUSTRIES supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

tracts unless the operators are willing to sign up at the present Federal prices. Furthermore, another hindrance to the making of contracts is the fact that they are subject to cancellation if the authorities desire to confiscate the coal for government purposes.—*Coal Age*.

## 4,941,276 Cars and Trucks in the United States

(Continued from page 538)

mont, which showed 24 per cent in 1916 and 30 per cent in 1917.

The total number of new registrations in New England showed a heavy falling off in 1917 as compared with 1916. In 1916 the increase in registrations was 86,421, whereas in 1917 the increase in registrations dropped to 58,239, a decrease of 28,182.

The record of holding the greatest number of automobile and truck registrations in relation to population is enjoyed by the agricultural states, with Iowa in the position of leadership with a ratio of one car for every eight persons in the state. Iowa has occupied this position of leadership for several years. In the calendar year of 1915 it had one automobile for every sixteen persons. In 1916 this ratio of cars was increased to one car for every thirteen. In the 1917 year a new record was placed at one for every eight.

Iowa has not much margin of leadership in this registration ratio, and again one of the great agricultural states is a close contender, Nebraska having one automobile for every nine of population. Nebraska has made rapid gains in the last three years. In 1915 the ratio was one car to every twenty-one persons. In 1916 it was cut to thirteen persons, and for 1917 it was placed at nine.

Iowa and Nebraska have a good lead on the other states, and following them are other agricultural states, with South Dakota one machine for every eleven, which figure is shared with Montana. Then come Kansas, North Dakota, Minnesota and California all on even terms,

## To Fix Steel Prices

### at Washington March 20

The naming of Wednesday, March 20, as the day for the price conference at Washington between the steel manufacturers and the War Industries Board is bringing to a head the issues raised by various producers. The diverse interests of the small producers, who must have a high price, and of the largest integrated companies, who can go on on the present basis, are more sharply accented.

The crux of the situation as it will come before the price conference next week is the country's ability to produce sufficient pig iron. A higher price is being urged by smaller furnace companies. On the other hand, some buyers of pig iron ask that the price be reduced, particularly on Southern iron.

A prime factor in all calculations as to steel for the second half of the year, which has not had sufficient emphasis thus far, is ability to increase the ship-building program.

The 30 per cent "curtailment" in passenger automobile production agreed on by manufacturers and the War Industries Board means little change in fact from the recent scale of operations due to falling demand. Only two large makers are named as likely to cut down present output. The sentiment is growing in some Washington quarters that a considerable part of the alloy steel now going to the automobile industry should be conserved for war uses. Heavy orders have gone to the mills in the last two weeks for ship material.—*Iron Age*.

with a car for every twelve of population.

Indiana, Ohio, Wisconsin and Oregon, all grain states, have a ratio of one automobile to every sixteen persons. In the western mining states, where population is sparse and distances great, there is a high ratio of cars to population. Nevada has a one-to-sixteen ratio. Wyoming has one to fifteen. Montana has one to eleven. Idaho has one to eighteen. Arizona has one to thirteen, and Colorado has one to fifteen.

The ratio of automobiles to population in the South is relatively high, notwithstanding the big percentage increases made in all of the Southern States in 1917, as compared with 1916. Florida, although showing a percentage increase of 174, has a ratio of twenty-three to one. North Carolina has sixty-four to one. Georgia has forty-one to one. It will be some time before the ratio in the South approaches the figures of the agricultural states in the Mississippi Valley.

The car population ratio in New England generally ranges at twenty-four to one, with the single exception of Connecticut, which has the record for the group, with a ratio of one car for every seventeen population.

## Reorganize Directorate of National Carbon Co.

CLEVELAND, March 12—The board of directors of the National Carbon Co. has been reorganized by election of directors so as to represent Union Carbide interests. The new directors are: M. J. Carney, W. J. Knapp and G. Ricks, and will fill the vacancies created by the resignation of J. S. Bartlett, Boston; M. J. Degnon, New York; W. Cameron Forbes, Boston; J. L. Severance, Cleveland; W. P. Schmuck and F. C. Walsott, New York. Officers of the National Carbon Co. were re-elected for the Union Carbide.

The Union Carbide & Carbon Co. was formed in October, 1917, as a holding company in the merger of the Presto-Lite Co., the National Carbon Co., the Union Carbide Co. and the Linde Air Products Co. Since that time the Air Reduction Co., the Electro-Metallurgical Co., the Michigan Northern Power Co., the Union Carbide of Canada, Ltd., the Electric Furnace Products Co., Ltd., and the Oxweld-Acetylene Co. have been consolidated.

## Signal Corps Conducts Cadillac School

DETROIT, March 11—The technical and repair school operated at the service station of the Cadillac Motor Car Co. has now been taken over by the Signal Corps and is being operated as a mechanical aeronautical school. Most of the students come from the government ground school at Kelly Field, San Antonio, Tex. Every 30 days a group of 20 enlisted men is sent to Detroit from Kelly Field. The course covers 30 days and each day there are 2 hours of lectures and 6 hours of practical shop work.

## 23,229 Trucks Made in Detroit

DETROIT, March 11—Detroit plants produced 23,229 trucks in 1917 at an ap-

proximate market value of \$45,462,000. The total production of Detroit and Flint, Lansing and Alma aggregated an approximate market value of \$60,962,000.

## Motor Parcels Post Route in Texas

TYLER, TEXAS, March 4—The second motor parcels post route to be established by the Post Office Department will be between Tyler and Dallas, a distance of 110 miles. The motor truck that will be used will also carry mail. The road between this city and Dallas was inspected and approved by government officials before sanction for the motor route was given. About nine hours will be required for the trip each way.

## Heads Non-Ferrous Department

WASHINGTON, March 9—The Non-Ferrous Department of the raw materials division of the War Industries Board has been placed in charge of Pope Yeatman, succeeding Eugene Meyer, Jr. Meyer remains a member of the raw materials division, but at present is engaged in special work for the Secretary of War. Yeatman was formerly a consulting engineer of New York.

## Canada Tractor Demonstration Next Fall

MONTREAL, March 9—The extensive farm tractor demonstration for eastern Canada has been scheduled to take place here Sept. 17, 18 and 19. It is expected that the recent removal of import duties from tractors will increase the number of foreign exhibits.

## Motor Freight Line in Utah

SALT LAKE CITY, UTAH, March 9—Operation of a motor freight service between this city and Ogden will be started at once by the Motor Freight Service Co., Salt Lake City. The state highway will be used, and the rates charged will be the same as those of the railroad.

## War Service Committee Appointed by N. A. D. A.

ST. LOUIS, March 11—A War Service Committee for the National Automobile Dealers' Association has been appointed by President Fred W. A. Vesper. It will co-operate with the Government's Commercial Economy Board in harmonizing the activities of the government with those of the dealers of the United States.

Various plans are in prospect. The members of the committee are:

F. W. A. Vesper, chairman.  
Earl C. Anthony, Los Angeles Motor Car Dealers' Association, Los Angeles.  
Charles Collier, Brown County Auto Trades Ass'n, Green Bay, Wis.  
A. E. Mitzell, Ohio Auto Trades Ass'n, Canton, Ohio.  
A. E. Maltby, Philadelphia Auto Trades Ass'n, Philadelphia, Pa.  
F. E. Murphy, Minneapolis Auto Trades Ass'n, Minneapolis, Minn.  
George W. Browne, Milwaukee Auto Dealers' Ass'n, Milwaukee, Wis.  
Dayton Keith, Chicago Auto Trades Ass'n, Chicago, Ill.  
J. H. McAlman, Boston Auto Trades Ass'n, Boston, Mass.  
George D. McCutcheon, Atlanta Auto Trades Ass'n, Atlanta, Ga.  
O. P. Tyler, Worcester Auto Trades Ass'n, Worcester, Mass.  
Fred J. Caley, Cleveland Auto Trades Ass'n, Cleveland, Ohio.  
Charles W. Browne, New York Dealers' Ass'n, New York City.  
Finley L. MacFarland, Rocky Mountain Automobile Ass'n, Denver, Col.

## Couzens No Longer Police Commissioner

DETROIT, March 9—James Couzens, police commissioner here, and formerly vice-president of the Ford Motor Co., was dismissed last week by Acting Mayor Walsh during the absence of Mayor Marx. The council demanded his dismissal 2 weeks ago, but the Mayor refused.

# Calendar

## ASSOCIATIONS

April 15-19—Little Rock, Ark., United States Good Roads Assn. Sixth Annual Session.  
June 5-12—Hot Springs, Va., National Assn. Automobile & Accessory Jobbers.  
June 17-19—Dayton, O., Society Automotive Engineers, Annual Midsummer Session.

## SHOWS

Mar. 1-15—Lyons, France, Third Sample Fair.  
Mar. 11-16—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.  
Mar. 11-16—St. Louis, Mo. Used Car Show. St. Louis Auto Manufacturers and Dealers' Assn. Exhibit Bldg.  
Mar. 12-15—Fargo, N. D., Gate City Auto. Show Co., Auditorium. J. W. Murphy, Mgr.  
Mar. 13-16—Raleigh, N. C., Auditorium. John Kelley, Mgr.  
Mar. 13-16—Warren, Pa., Warren Automobile Dealers' Assn., Russell Garage.

Mar. 13-16—Peoria, Ill., Peoria Auto. Accessories Dealers' Assn. W. O. Ireland, Mgr.  
Mar. 15-20—Great Falls, Mont., Montana Automobile Distributors' Association. Lexington Garage. A. J. Breitenstein, Mgr.  
Mar. 19-23—Vancouver, B. C., Western Canada Automobile Show Assn., Horse Show Bldg. D. A. Hamilton, Mgr.  
Mar. 20-22—Houlton, Me., Second Annual Houlton Motor Car Dealers' Assn., Bangor St. Exhibition Hall. J. D. Luther, Mgr.  
Mar. 20-23—Holdrege, Neb., Second Annual of South-west Nebraska.  
Mar. 20-23—Greensboro, N. C., First Annual. John Kelly, Mgr.  
Mar. 20-23—Trenton, N. J., Trenton Auto Trade Assn., Second Regiment Armory. John L. Brock, Mgr.  
Mar. 25-30—Rochester, N. Y., Tenth Annual Rochester Auto. Trades Assn., Exposition Park. C. A. Simmons, Mgr.

Mar. 25-30—Bridgeport, Conn., Fourth Regiment Conn. Home Guard State Armory and Casino. B. B. Steiber, Mgr.  
Mar. 27-29—Fort Fairfield, Me., Reed's Garage. R. F. Reed, Mgr.  
Mar. 30—April 6—Hartford, Conn., Eleventh Annual Hartford Automobile Dealers' Assn., Inc. State Armory. B. F. Smith, Mgr.  
Mar. 30-Apr. 6—Atlantic City, N. J., Second Annual Garden Pier. S. W. Megill, Mgr.  
Mar. 30-Apr. 6—Chicago, Ill., Second Annual Chicago Used Show. Chicago Auto. Trade Assn. Coliseum.  
Apr. 1-6—York, Pa., York Auto Dealers' Assn. T. F. Felfer, Mgr.  
Apr. 6-8—Green Bay, Wis., Brown County Automobile Trade Assn.  
Apr. 6-13—Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory. E. C. Von Kattengell, Mgr.  
Apr. 8-13—Reading, Pa., Read-

ing Automobile Trade Assn.  
Apr. 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.  
Apr. 16-20—Deadwood, S. D., City Auditorium.  
Apr. 17-19—Davis, Cal., Tractor Demonstration. University of California.  
Apr. 17-20—Calumet, Mich., Upper Peninsula Show. Copper County Automobile Dealers & Garage Owners' Assn., Coliseum.  
May 3-7—Lima, Ohio, Ohio State Automobile Assn.  
Sept. 23-28—Chicago, National Accessory Show for Fords, Coliseum.  
  
**ENGINEERING**  
June 19-22—Berlin, N. H., American Institute of Chemical Engineers.  
June 26-28—Buffalo, N. Y., American Society of Heating and Ventilating Engineers.  
Sept. 2—Cripple Creek, Colo., American Institute of Mining Engineers.